FACTORY

MANAGEMENT AND MAINTENANCE

A McGRAW-HILL PUBLICATION

MARCH 1943

ABSENTEEISM How to Reduce It | Getting the Most Out of Electric **MOTORS**

With every pound of metal allocated on the basis of greatest need, conservation is naturally the aim of every thoughtful engineer. This is reflected in today's specifications, which show the care given to designating the most durable available material in each individual service.

Because of its outstanding record in combating the severe corrosion encountered in many piping applications, wrought iron is extensively specified. In some instances where welding is employed, however, substitution of fittings made of ordinary materials has been made or suggested, on the excuse that genuine wrought iron welding fittings were not available.

Such a substitution is like connecting two hoist chains with a clothes-line, and may cancel out all the benefits of the specifiers' care in selection. The facts are that genuine wrought iron welding fittings have been, and are being produced.

A. M. Byers Company does *NOT* make these fittings, but *DOES* supply wrought iron to fitting manufacturers.

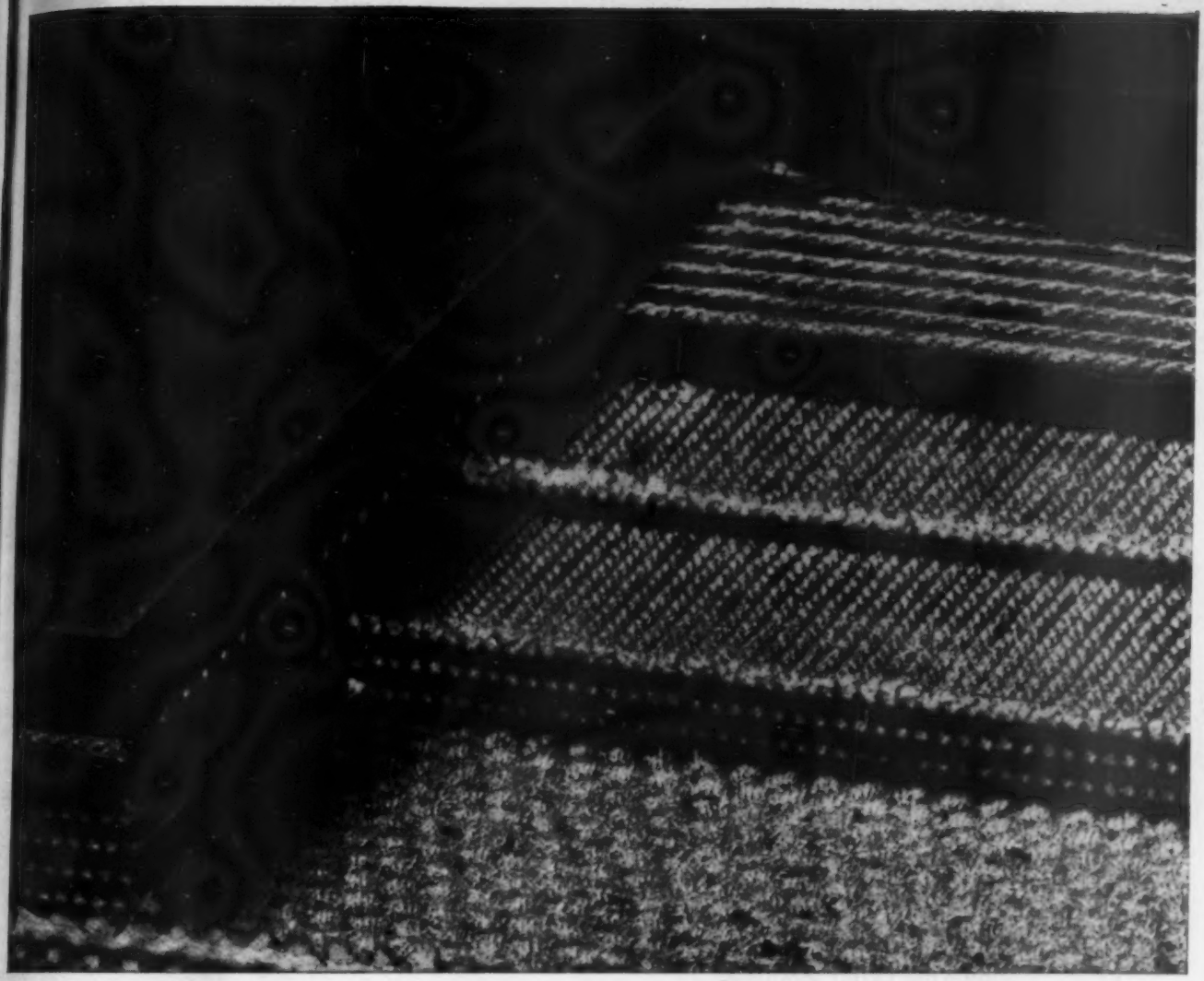
We urge that you get in touch with (1) a Byers Field Service Engineer, (2) the nearest Byers District Office, or (3) the Byers General Office in Pittsburgh for definite information on available sources of supply of genuine wrought iron welding fittings. By so doing, we will put you in touch with these sources and you will therefore have authoritative information to go on rather than rumor or heresay.

Please do not hesitate to write, if we can help you.

A. M. Byers Company. Established 1864. Offices in Pittsburgh, Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

Corrosion costs you more than Wrought Iron

BYERS GENUINE WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
STEEL TUBULAR PRODUCTS

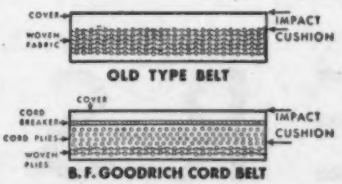


How B. F. Goodrich cord belts may help you save rubber

UNDER current rubber restrictions B. F. Goodrich *cord* conveyor belts may help save rubber and at the same time save your own trouble and time.

Belt cover thicknesses are now limited, skim coats of rubber between plies have been prohibited in most grades. So the cushioning quality of ordinary belts is now greatly reduced; but cord belts are almost the same as ever—because a cord ply has nearly the same cushioning quality as a rubber cover.

Not everyone can get cord belts, but a special effort should be made *when belts have to stand severe impact.* They'll last so much longer they'll save the rubber needed for many replacements. Use this B. F. Goodrich belt for the hard jobs; ordinary belts for the lighter, routine jobs—and the rubber-saving program will really work at its best.



Cord plies absorb heavy blows because cords imbedded in rubber, without cross strands, can spread apart under impact. Each ply adds cushion—and impact resistance in belts varies as the *square* of the cushion depth. The diagram shows how cord belts increase this cushion, why they'll last so much longer in any severe service.

If you're buying conveyor belting now or soon, find out if you can get these B. F. Goodrich belts. Any B. F. Goodrich distributor can give you full information. Most distributors can give other rubber-saving service too (salvaging worn belts, repairing and splicing with portable electric vulcanizers). Call the one nearest you or write to *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

B.F. Goodrich

FIRST IN RUBBER

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Reporting on Current Steel Stocks

As you may know, the steel warehouse industry entered the war period with large and complete stocks. These reserve stocks of steel enabled industry to switch over quickly from peace to war production. However, in the process, stocks of steel in the warehouses of the country became seriously depleted. In fact, these great sources of emergency steel became almost non-existent.

No matter how carefully plants are maintained and production programs scheduled, there are always times, particularly under our heavy war load, that certain lots of steel must be secured immediately or production is imperiled. So companies working at top speed and embarrassed by their inability to secure steel quickly from warehouses, began reporting their problems. The War Production Board was quick to grasp the situation and assign special allotments to the warehouses. A bad situation is now gradually being improved and we are glad to report that our stocks are somewhat better assorted.

In order to eliminate the time required for many roll changes and so to permit increased overall production of steel, we are concentrating on the most generally used sizes. In spite of this curtailment of our usually very broad range of sizes we are now better able to serve than at any time in recent months.

When you need steel or have a problem of selection or fabrication, get in touch with your nearest Ryerson Steel-Service Plant. Our engineers and metallurgists will be glad to work with you. Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON

Heat-treating was one of the first subjects proposed when *Factory* began its full-color covers. That was four years ago. This month we have it. It came from Lockheed, was taken by Pat Clark of the Vega photographic department, shows stainless steel bomber parts being heat-treated at 1960 degrees Fahrenheit in a gas-fired annealing furnace.

A. M. STAEHLE, Publisher • L. C. MORROW, Editor • L. K. URQUHART, Managing Editor • G. A. VAN BRUNT, C. B. COATES, Associate Editors • S. M. COE, KATHLEEN NORTH, Assistant Editors • A. H. MOGENSEN, WHITING WILLIAMS, Consulting Editors • H. P. DUTTON, Chicago • C. B. GORDY, Detroit • PAUL WOOTON, Washington • H. E. HILTY, Sales Manager.

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FACTORY

MANAGEMENT AND MAINTENANCE

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He's carrying more loads, bigger loads . . . and carrying them farther. Doing a wonderful job, too, in spite of all handicaps.

You can help him. Not necessarily because you're philanthropic, but because it's to your own interests to lend a hand. It's only good business to help your railroad shipments go through undamaged . . . to prevent waste of materials, manpower, machinery, time and shipping facilities.

You can help tremendously merely by using better corrugated shipping boxes . . . boxes that are sturdier, stronger, better engineered to stand up under longer hauls, heavier loads, and handling by inexperienced men.

The few extra pennies in original cost will soon be dwarfed by month after month savings. You can prove that to your own satisfaction by writing the H & D Package Laboratory. Learn what has been done for others, what can be done for you.

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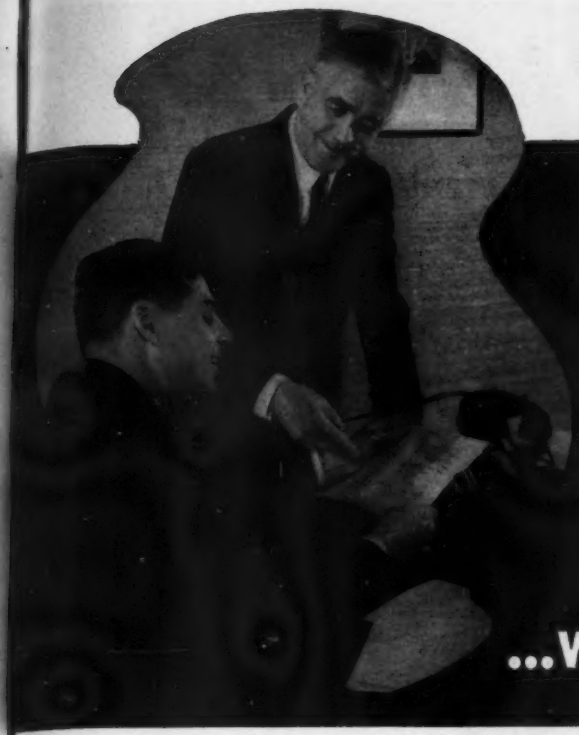


By getting away from *Piecemeal Bids*— ...we got the job done faster

An actual example of the time-saving gains of the Graybar MM Plan*

The contractor for an important Mid-West ordnance plant had solicited bids on electrical supplies on a piecemeal basis, month-to-month. For each order, requisitions went from the engineering department to the purchasing department, which in turn obtained prices from a number of different sources, and finally let the contract with a plea for fast delivery. In the meantime, several weeks time were lost, and no plan for scheduling deliveries could be developed.

Working with the project engineer to speed up delivery, GRAYBAR proposed that bids for material be sought on an "all-that's-needed" basis, covering the period of construction of the entire project. Then, items could be obtained as needed from a continuous source of supply.

The proposal was adopted, and GRAYBAR'S quotations proved that no sacrifice of economy was necessary in instituting the new purchasing plan. The balance of electrical supplies for the job were delivered *as needed* by GRAYBAR. Delivery delays were cut, record-keeping was simplified, and the contractor expressed himself as "entirely satisfied".

In other cases, purchasing is done on "open order", without securing estimates, again at no sacrifice in economy, and with an appreciable saving in time.

***Serving as your MATERIALS MOBILIZER**

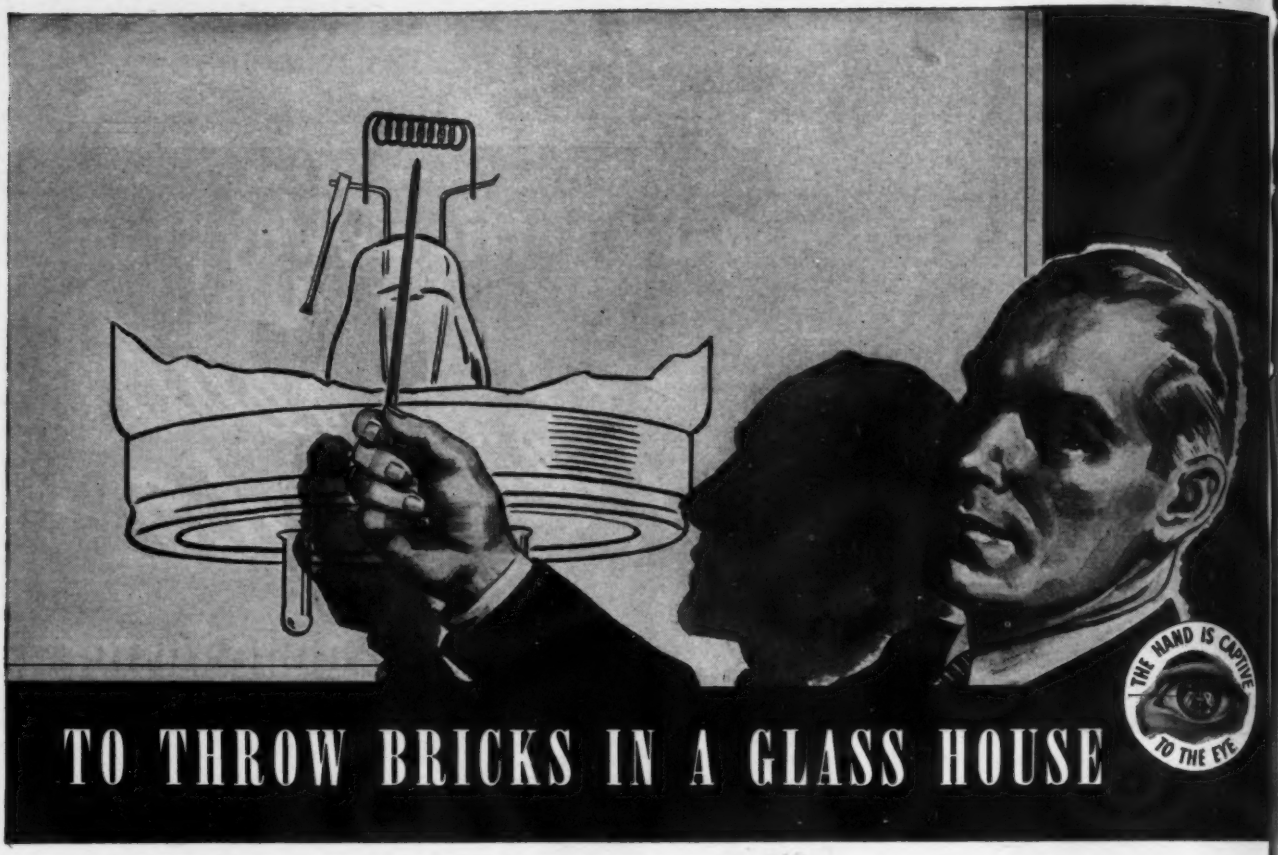
. . . on electrical supplies, GRAYBAR makes its procurement experience a part of your war production facilities. In less than one hour, your GRAYBAR Procurement Adviser can review the *four-point plan* which "dovetails" your electrical needs with the available production of more than 200 electrical manufacturers, distributed locally from more than 80 warehouses. Why not call him about it today?

Executive Offices: GRAYBAR BUILDING New York, N. Y.

GraybaR

IN OVER 80 PRINCIPAL CITIES

GRAYBAR Everything Electrical . . . . THAT IT TAKES TO WIN!



TO THROW BRICKS IN A GLASS HOUSE

Hair-fine tungsten, almost invisible to the naked eye until coiled and recoiled, constitutes a cathode. It is coated with a compound which allows it to throw electrons, the bricks of the universe, in the glass house of a fluorescent lamp.

The cathode is a delicate but tough electronic element in the production of fluorescence, which provides the best lighting known for war plants today—and for your home when Victory is won.

At the flick of an electric switch, the cathode throws free electrons—billions of them—into the low-pressure mercury-argon vapor inside the lamp. Free electrons batter mercury atoms, throwing them off balance electrically and into violent motion. In regaining electrical balance, mercury atoms generate ultra-violet rays. This "Black Light" magically makes the "powdered daylight" coating inside the tube fluoresce in a cool, glarefree, shadowless glow more constant than daylight—and just as kind to the human eyes.

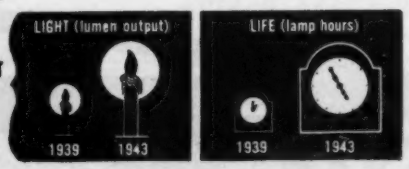
During more than ten years of independent research, Sylvania engineers have led in the development of more efficient, more durable cathodes. Electron-emissive material, which is expended in the process of light-making, largely determines lamp life; therefore its chemical formula and application to tungsten are the subject of tireless study.

Improvements in material and process specifications are made every week at Sylvania. Many of them, like the "Mercury Bomb" method of precise mercury measurement, conserve strategic materials and labor. But all of them step up fluorescent performance on such counts as lumen output, lamp life, uniform colors, quicker starting—and at progressively lower cost.*

While today's Sylvania Fluorescent Lamps are serving three-shift days in America's war plants, tomorrow's are being made even better. Specify Sylvania replacements for the latest in fluorescent research.

FAR MORE LIGHT AND LIFE FOR YOUR MONEY

*Compared with 1939 a dollar invested today in Sylvania Fluorescent Lamps buys more than four times the lumen output and approximately five times the lamp life.



(Based on decreasing price and increasing efficiency and durability of Sylvania 40-Watt White Fluorescent Lamp)

Even on existing circuits, a change-over to fluorescent—Sylvania Lamps, Fixtures and Accessories—will probably more than double the light you get for the same wattage.

SYLVANIA

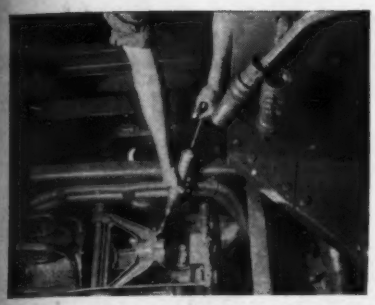
ELECTRIC PRODUCTS INC.

formerly Hygrade Sylvania Corporation
Salem, Mass.

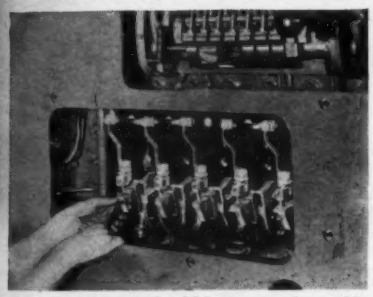
Incandescent Lamps, Fluorescent Lamps, Fixtures and Accessories, Radio Tubes, Electronic Devices.

How to keep Your Trucks Running

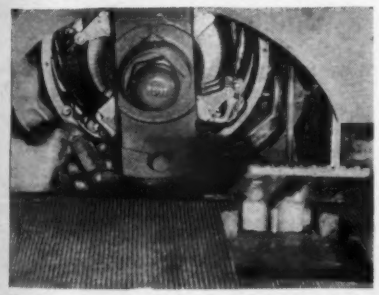
FOR THE DURATION



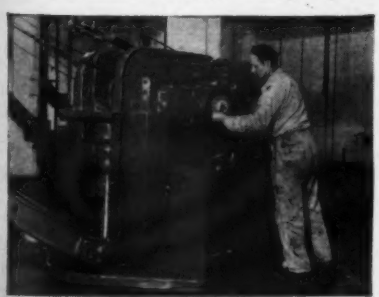
Correct lubrication according to manufacturer's instructions is an essential phase of truck care.



Control equipment should be inspected monthly. Here mechanic is replacing a finger tip.



Dust covers should be removed monthly to inspect commutators and brushes. Brushes should have at least 60% bearing surface.



Removing the rotor disc from the magnetic disc brake for monthly inspection.

● Proper maintenance of industrial trucks always pays dividends, but today it becomes a deciding factor in the success of our war production effort. Because of their ruggedness, trucks are often neglected until something goes wrong. Delays are costly and damaged parts difficult to replace. Most truck failures can be avoided by the routine care and maintenance outlined in this advertisement.

First—Provide good floor conditions and *DO NOT* overload. Keep aisles clear of chips or scrap that damage tires. Keep loads within capacity limits for which truck was designed.

Second—Place trucks under the supervision of a competent machanic for thorough weekly inspections. Do not "tinker" with truck. Make adjustments only when necessary.

Third—Lubricate regularly as instructed by manufacturer. Use proper types of lubricants as well as best quality. Do not over-lubricate. If possible, assign a lubrication expert to the job.

Fourth—Keep a record sheet covering weekly inspection findings, lubrications, adjustments, repairs. Thus excessive wear can be spotted and serious damage overcome.

ROUTINE SCHEDULE FOR TRUCK MAINTENANCE

Every Day—Blow off dust and dirt before proceeding with oiling the cold points. Wipe oil holes clean, and oil all bearings, pins, joints and other "cold points" on brakes, steering linkage, interlocking mechanisms and switch controls. Check battery as per instructions.

Every Week. *BRAKES*—Test service brakes for stopping with maximum load, and parking brakes for holding on steepest incline. Adjust as required. Inspect linings—if dirty or greasy, wash in gasoline, if worn, replace. Make sure drum is not scored or rough, and true up shoe to fit drum.

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STEERING CONNECTIONS—Test for:

a) Lost motion at ball joints and rod yokes due to wear.
b) Tight joints at rod yokes due to bent levers or rods.
c) Misalignment of steering wheels.
d) Worn bearings in steering post or ball crank.

Make adjustments according to instructions, and replacements as required. Bent rods should be straightened, but bent levers should be replaced. *WHEEL ALIGNMENT*—Follow manufacturer's instructions for checking and lining up wheels on each type of truck. *LIFT OR HOIST*—Clean grease and dirt from rails, inspect chains, anchor bolts, hydraulic system, and limit switch. Use neatsfoot oil to keep leathers soft. *LUBRICATION*—Follow manufacturer's instructions for points requiring weekly lubrication. *ELECTRICAL EQUIPMENT*—If working in dusty environment, remove covers from motors and electric controls, and blow out dust.

Every Month—Monthly inspection covers the most important mechanical parts of truck: power axle, wheel bearings and universal joints, spindle bearings, drive and torque yokes, Oldham coupling, trailing axle and wheels, brake drum, motors, brushes, controller, contactor, limit switches, hydraulic lift. Repairs on these parts are costly. Do not slight any part that requires lubrication. Keep moving parts free from dirt and grease. Follow detailed instructions from manufacturer.

Every 6 Months—Truck should have a complete check-up, involving all parts. Change oil in power axle, hydraulic oil in lift reservoir. Wheel bearings should be taken out, cleaned and re-packed (if not done monthly). Inspect wiring for insulation and all electrical connections for tightness.

Maintenance check list is available in bulletin form. Write for your copy or copies today.

BAKER INDUSTRIAL TRUCK DIVISION *of The Baker-Raulang Company*
2178 WEST 25th STREET • CLEVELAND, OHIO
In Canada: Railway and Power Engineering Corporation, Ltd.

Baker INDUSTRIAL TRUCKS

GRINDERS
LATHE
MILLING
OPERATORS
ALSO
Draft Exempt Men
Who have some mechanical ability.
Hourly rate, plus overtime.
58 Hours Week
WAR WORK
If now on war work
do not apply.

Women Welcomed!

No, the young woman at the lathe is not a "glamour-girl," especially selected because she is photogenic. She's an honest-to-goodness worker on a Monarch lathe, doing war production work. She never saw the inside of a machine shop before she was hired, but in a few weeks she was turning out a good day's work of precision parts, accurately and on schedule.

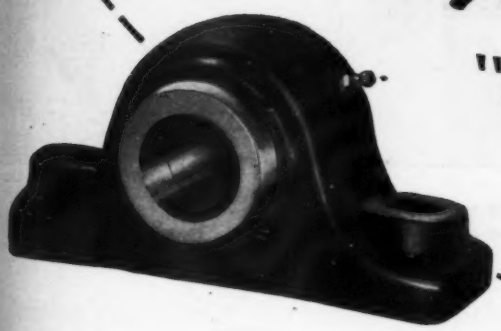
Part of her success, and that of the thousands of women now in war work, lies in careful selection, adequate training and helpful supervision. Part of it also—at least for those women who work on Monarch lathes—is due to the ease of operation, the precautions taken to lessen fatigue, and the accuracy and dependability built into Monarchs.

For the vast majority of turning work done on Monarchs, you can welcome women at your employment office and in your plant. The substitution of "woman-hours" for man-hours will effectively help give you more machine-hours. If you'd like some firsthand information on the subject, send for the booklet, "Women in Production Work." It's yours for the asking.

THE MONARCH MACHINE TOOL COMPANY
SIDNEY • • • OHIO

MONARCH LATHES *Cover the Turning Field*

A REGIMENT OF *Friction Fighter* BEARINGS "KEEPS 'EM ROLLING" AT THIS PLANT



● Over 500 Friction Fighter ball and roller bearings are used on live rolls for charge and discharge ends of the hardening and tempering furnaces and car haulage drives for charging annealing furnaces at Dominion Foundries & Steel, Ltd. (Furnaces by The Drever Co.) Friction, the saboteur, cannot impede the movement of armor plate through these furnaces on the way to vital war service. Friction Fighter bearings combat strains of thrust and radial loads and misalignment. They roll on freely without a grunt or squeal with minimum attention over long periods. Put Friction Fighter bearings on guard in your war production equipment—conserve power and speed production. Furnished without mountings in ball and roller types or as pillow blocks and units of the cartridge, flanged, take-up, hanger or duplex types. Get the facts in Data Book No. 1775. Link-Belt Company, Indianapolis, Chicago, Atlanta, Philadelphia, Dallas, San Francisco, Toronto. Branch offices, warehouses and distributors in principal cities.

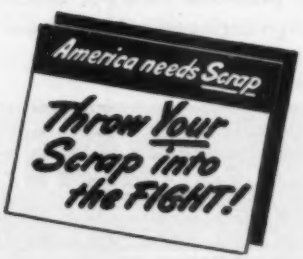
8935

LINK-BELT

FRICTION FIGHTER

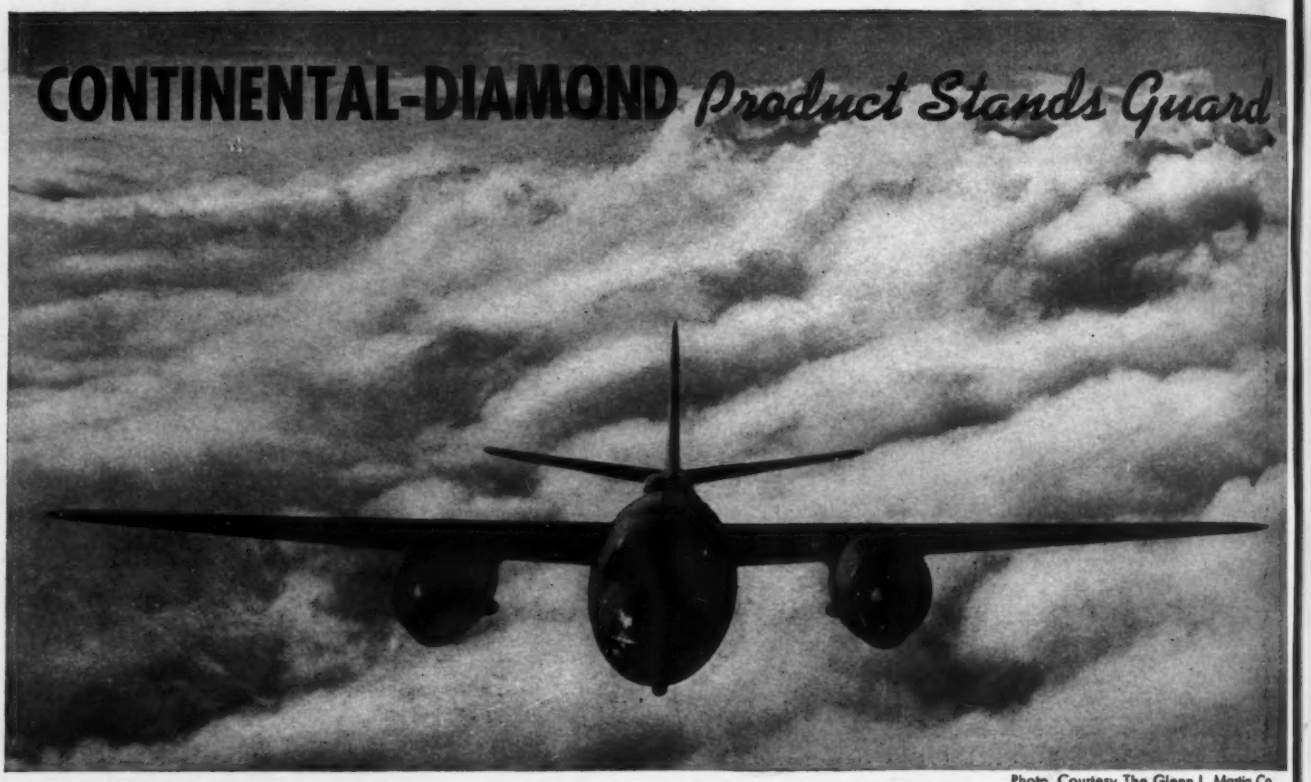
BEARINGS

Roller and Ball Types



TOKYO....BERLIN....ROME

Leaking Gas Tanks Might Mean Disaster...so a



Photo, Courtesy The Glenn L. Martin Co.

DIAMOND *Vulcanized* FIBRE *Tank Shells*

DIAMOND VULCANIZED FIBRE, tough . . . light (about ½ weight of aluminum) . . . shatterproof . . . easily formed, glued, fabricated . . . unaffected by oil or gasoline . . . has proved the ideal material for leakproof gas and oil tank shells. Tanks utilizing DIAMOND FIBRE have been used in many of the United Nations spectacular air battles and raids, contributing mightily to the high percentage of planes returning safely.

C-D has been manufacturing Vulcanized FIBRE since 1895 . . . almost a half a century of research, experiment, manufacture and application experience are part and parcel of every pound of DIAMOND FIBRE used by industry today. This gas tank job is only one of many being performed today by DIAMOND FIBRE in the War Effort.

This versatile material may be the answer to one or more of your "What Material?" problems. Send for Bulletin DF-3. When you are ready, our design engineers will study your problems with you.

RUBBER SHEATHED, BULLET SEALING FUEL TANK AS PRODUCED BY THE GOODYEAR TIRE & RUBBER COMPANY

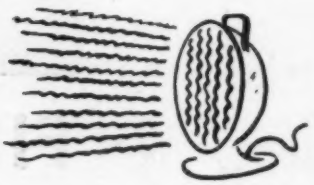
Continental - Diamond FIBRE COMPANY

Established 1895 . . Manufacturers of Laminated Plastics since 1911 — NEWARK • DELAWARE

Motors Run a Fever?

No wonder if they do more often today. They're working 3 and 4 times as many hours a year as in peace!

When a motor runs hot in your plant, do your men have explicit directions for locating the cause? If not, send in for your free copy of "Guide to Wartime Care of Electric Motors". Its QUICK DIAGNOSIS OF MOTOR AILMENTS is invaluable!



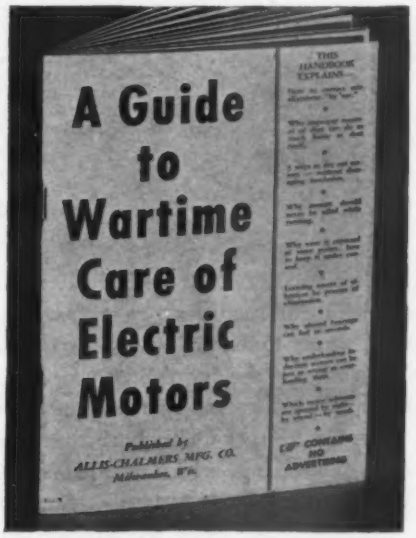
Friction makes heat — and so does electrical resistance. Pages 8 and 9 of Allis-Chalmers' new book tell how wartime preventive maintenance should fight friction . . . pages 16 and 17 outline strategy for preventing overload. Recommendations are simple, practical, *geared to wartime* — ideal for training.

Insulation is "fried" by excessive heat — bearings burned out — soldered connections melted. Play safe . . . put Allis-Chalmers' new motor maintenance guide to work protecting *your* motors!

HERE'S the arithmetic of the wartime motor maintenance problem: motors that worked 1800 hours in a peace year now work up to *8700 hours!*

A killing schedule—yet motors now must last *longer* than ever before — and wishing won't make it so.

One thing will: the new *wartime* standard of motor care set forth in Allis-Chalmers' new motor maintenance guide. Already, 70,000 copies are in use in plants all over the U. S.!



Contents of this valuable new publication include the 9 main enemies of electric motors and how to fight them . . . dust, stray oil, moisture, friction, misalignment, vibration, uneven wear, overload and underload. Send in today for *your* free copy to ALLIS-CHALMERS, MILWAUKEE, WIS. A 1591

ALLIS-CHALMERS

WE WORK FOR VICTORY · WE PLAN FOR PEACE

Gulf Super-Quench smashes a bottleneck—

plant ups submachine gun production 100%!

Another example of the greater quenching power of this revolutionary new quenching oil.

Heat treatment of the bolt was the bottleneck in submachine gun manufacture in a large ordnance plant until Gulf Super-Quench was used to quench this part.

To obtain the required surface hardness of Rockwell C-52, it was formerly necessary to carburize the bolt. With Gulf Super-Quench, this hardness is obtained without carburizing, which means a 50% reduction in heat treating time.

In addition, Gulf Super-Quench hardens the bolt through its entire cross section. *Result: bolts of better quality, a 100% increase in production of submachine guns in this plant!*

In plant after plant, this revolutionary new quenching oil is achieving remarkable results. Many parts for the weapons of our armed forces are being made harder and tougher with Gulf Super-Quench than was ever before possible with oil quenching. And yet Gulf Super-Quench has the same minimum tendency towards distortion and cracking that is characteristic only of mineral, fish, and fatty oil quenching media.

Here's the important reason why Gulf Super-Quench is a superior quenching oil: It has *dual action*—a faster cooling rate through the hardening temperature range, and the slow speed of conventional quenching oil below the hardening temperature range.

Gulf engineers are at your service in 30 states from Maine to New Mexico to consult with you on your quenching problems.

FOR VICTORY
BUY
UNITED STATES
WAR BONDS
AND STAMPS

GULF INDUSTRIAL LUBRICATION

Mail This Coupon Today

Gulf Oil Corporation — Gulf Refining Company FMM
3800 Gulf Building, Pittsburgh, Pa.

Without obligation, please have a Gulf Service Engineer call to consult with us on our quenching problems.

Name _____

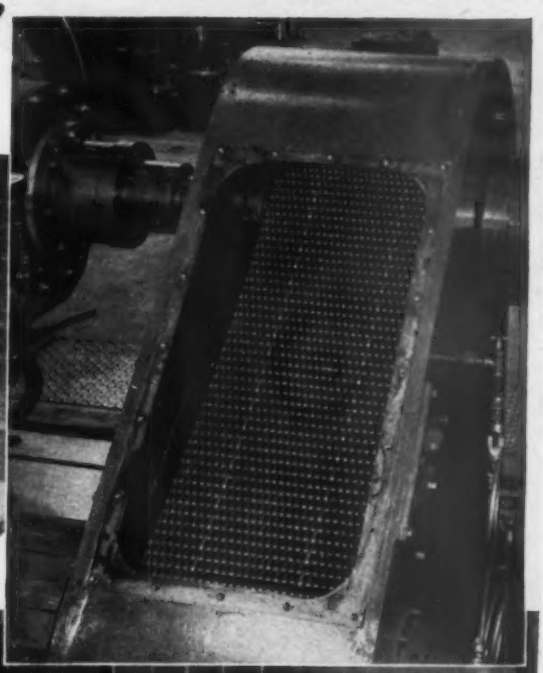
Company _____

Title _____

Address _____

TANK DRIVE UNITS

Given "the works"



High Efficiency of Silent Chain Drives Provides Precision Mechanical Testing

Twin Disc Clutch Co. has been testing hydraulic torque converters, used on tanks, by the "four-square" method, employing two large dynamometers and a motor-generator set. Increased production of the unit created a need for a second test rig.

Two 660 H. P. high-speed Link-Belt Silverstreak silent chains and sprockets with jack-shaft and couplings, now duplicate the function otherwise performed by one dynamometer and the motor generator.

The output shaft of the torque converter operates at 750 r.p.m. with a chain speed of 4220 feet per minute. This turns the jack shaft, which in turn drives the second silent chain, at 4450 f.p.m. and transmits its power to the input shaft of the converter. Chains are oiled by pressure spray oilers designed and built by Twin Disc engineers. The users report completely satisfactory results have been accomplished with the two Silverstreak silent chain drives, which have permitted them to double their testing facilities without delay. Link-Belt Company, Indianapolis, Chicago, Philadelphia, Atlanta, Dallas, San Francisco, Toronto. Offices, Warehouses and Distributors in Principal Cities.

9032

LINK-BELT
Silverstreak

DOWNED! BY THE 17,901st?

GUNS BLAZE in the dark sky. That boy up there trusts his own skill and courage—and the many thousands of metal parts that keep his plane strong and flying against heaviest odds.

What if some tiny part *we* helped to make turns traitor in mid-battle?

If we could only see those tracer bullets sow red death across the cockpit, feel with him his sharp and lonely peril in the sky . . .

We'd say, "Our pay is still the comfort of our homes; his pay hot lead, night battles, chance of flaming death."

We'd say, "If we don't give the best we've got, our smallest failure is a crime against the life he scarcely lived and gladly risked for us."

And so we pledge: to make each metal part that keeps him fighting *true* to the minutest fraction; to conserve our metal; to work with our best skill; to think with precision; and so keep faith with those who do our fighting.

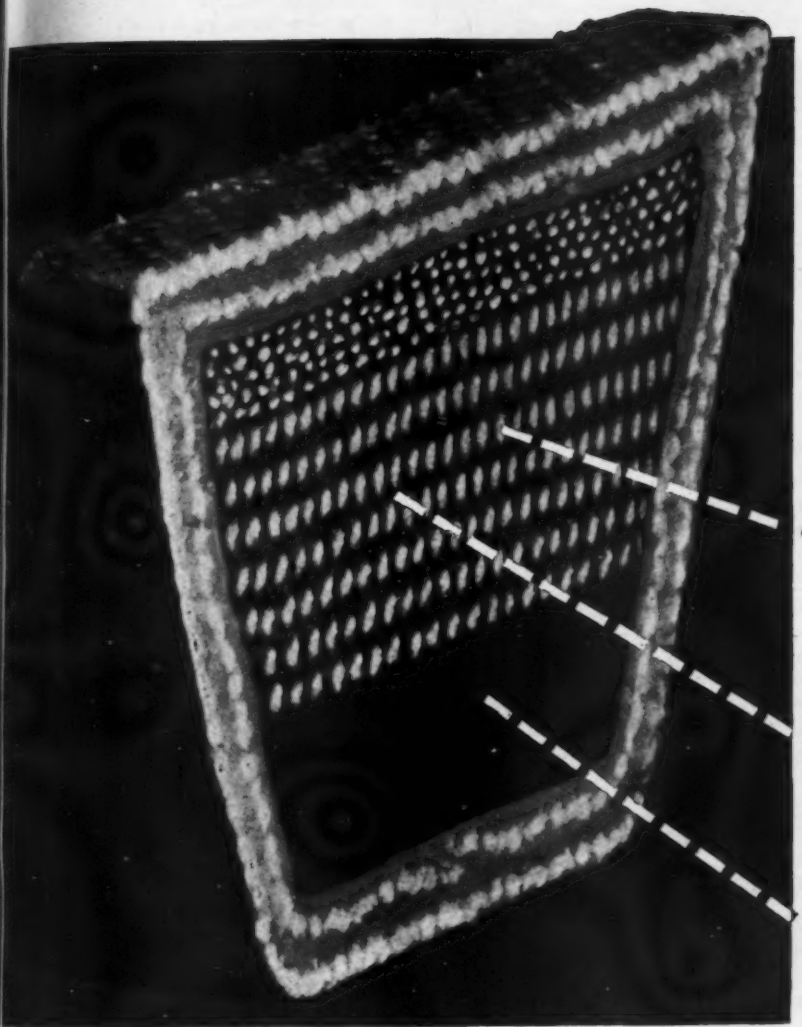
In this spirit, we at R B & W pledge ourselves to strength and accuracy in the millions of Empire bolts and nuts that we are making to hold American war equipment together. To R B & W's special manufacturing processes, developed through the years, we add the personal energy and care that forms an essential part of R B & W's contribution to Victory.

Reproductions of this ad re-arranged with a slogan for your War Production Drive, are free, upon request. Write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

RB&W *Making strong the things that make America strong*

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Here's a Slice of LONGER V-BELT Life!



It's the section of a new Texrope Super-7 . . . and the new ways Longer Life is Built right into it Point to ways *You* can make Your V-belts last Longer.. whatever Brand you Use!

V-Day needs every V-Belt

50% STRONGER CORDS produced by the new Flexon process combat stretching. **YOU** can fight stretching—and the slip and burning that result — by promptly taking up any slack that may develop. Remember, many V-belts are now working four times as many hours a week as in peacetime, may need inspection *four times as often!*

★

20% MORE CORDS than before help protect the new Texrope Super-7 against strains and breaks. **YOU** can minimize breaks in your plant — whatever make of V-belts you use — by requiring that V-belts *never* be pried into grooves. For V-belts, prying is a back-breaking operation!

★

COOLER-RUNNING CUSHION of special rubber "eases" cords around sheaves—for smoother flexing and less heat. **YOU** can fight heat by preventing misalignment. It causes rubbing of belt sides, extra heat and shorter V-belt life. So keep sheave grooves in line—shafts parallel.

★

WHEN YOU DO NEED new V-belts, *invest in the best* — Texrope Super-7!

A 1543-A

FREE! Every engineer should have this valuable new handbook in his technical library.

It applies to *all* makes of V-Belts—contains no advertising. Write Allis-Chalmers for it *now!*

ALLIS-CHALMERS

TEXROPE SUPER-7 V-BELTS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

*Trade mark registered U.S. Patent Office. Texrope super-7 V-Belts are the result of the cooperative research and design genius of two great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by Allis-Chalmers. Available in all sizes — ½ h.p. to 2,000 h.p.

NOW MORE IMPORTANT THAN EVER BEFORE...

Speed plus Safety!

You get both in a Macwhyte Atlas Braided Wire Rope Sling

ADD THESE, too...

- *Light-weight, flexible, easy to handle*
- *Positively NON-SPINNING*
- *Kink-Resistant*
- *Patented construction of LEFT-&-RIGHT LAY ropes*
- *Non-damaging to loads*
- *Store in small space*
- *No splices to wicker*
- *Terminate in natural loop-ends*
- *L-O-W final cost*

Yes, this sling body is responsible for ALL these advantages.

See how the wire ropes are spirally woven? (See illustration below.) Notice how uniform the braided body is? Two endless wire ropes, one left-lay construction and one right-lay construction, are woven in a uniform spiral throughout the length of the sling. No other sling is made like this one. The result is a lifting element of unmatched strength and flexibility.

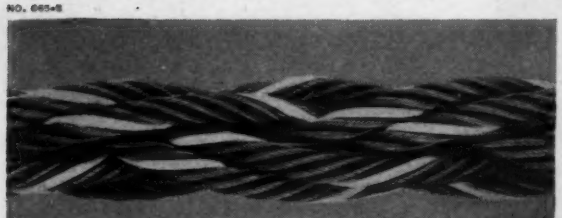
Today, Macwhyte Atlas Slings are safely speeding production of countless guns, tanks, engines, ship sections, and hundreds of equally vital war materials. They can help you, too. Write on your company letterhead for complete story. Address Macwhyte Company, 2902 Fourteenth Avenue, Kenosha, Wisconsin.

CONSULT WITH US—SAVE TIME, DELAY

Time is vital. Help save yours by taking advantage of our sling experience. You know what work you want the slings to do; we can tell you, from years of experience, the sling design best suited for that job.

Before taking time to design the sling yourself, why not consult with our engineers? They can simplify the sling equipment needed, make every inch of steel give MAXIMUM service. That's what YOU want. That's what YOUR COUNTRY asks.

Time and materials are vital. On sling problems, consult Macwhyte. Save both time and materials.

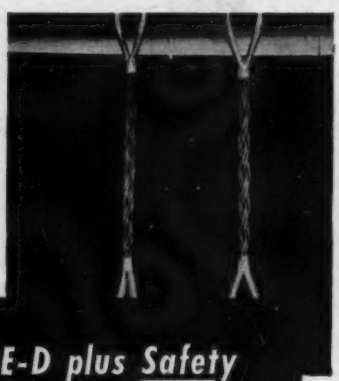


Left-Lay Ropes are woven in a right-hand (lay) spiral.

Right-Lay Ropes are woven in a left-hand (lay) spiral.

Thus we have a sling body made from opposite lay ropes which are woven in a direction contrary to the lay of the rope itself.

This is what makes Atlas Slings so flexible. This is what gives you Speed Plus Safety.



S-P-E-E-D plus Safety

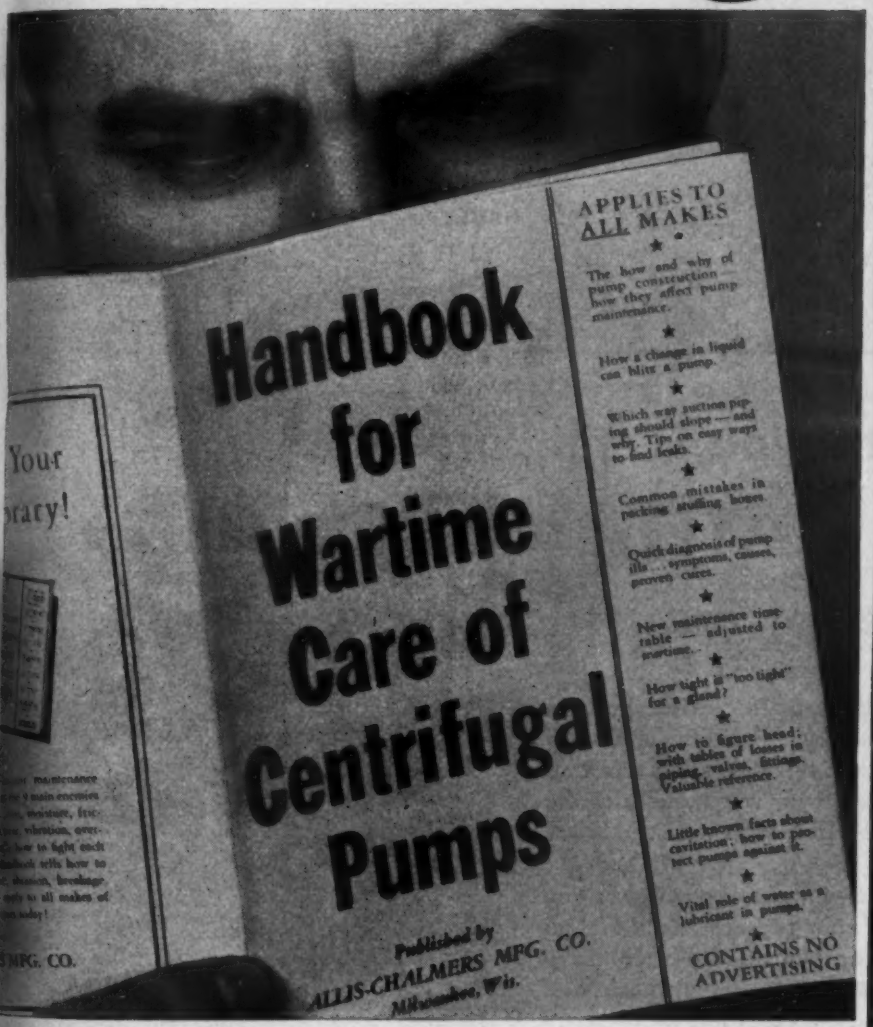
MACWHYTE ATLAS

Braided Wire Rope **SLINGS**

"The sling with the perfectly balanced body"

MACWHYTE COMPANY, 2920 Fourteenth Avenue, Kenosha, Wisconsin
Manufacturers of wire rope to meet every need—Left-&-Right Lay Braided Slings—Aircraft Cable, Aircraft Tie-Rods, and "Safe-Lock" Swaged Terminals.
Mill Depots: New York · Pittsburgh · Chicago · Fort Worth · Portland · Seattle San Francisco. Distributors throughout the U. S. A.

Required Reading!


Handbook for Wartime Care of Centrifugal Pumps
APPLIES TO ALL MAKES
The how and why of pump construction — how they affect pump maintenance.
How a change in liquid can blitz a pump.
Which way suction piping should slope — and why. Tips on easy ways to find leaks.
Common mistakes in packing stuffing boxes.
Quick diagnosis of pump ills . . . symptoms, causes, proven cures.
New maintenance timetable — adjusted to wartime.
How tight is "too tight" for a gland?
How to figure head; with tables of losses in piping, valves, fittings. Valuable reference.
Little known facts about cavitation; how to protect pumps against it.
Vital role of water as a lubricant in pumps.
CONTAINS NO ADVERTISING
Published by ALLIS-CHALMERS MFG. CO. Milwaukee, Wis.

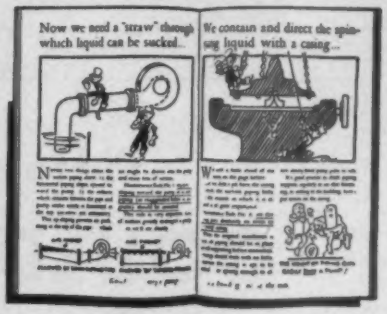
Your copy is free! Allis-Chalmers will gladly mail copies of "Handbook for Wartime Care of Centrifugal Pumps" *free of charge*. It applies to *all* makes — contains no advertising. Use it to make present pumps last — and when you *do* need new pumps, look into the extra efficiency and long life built into Allis-Chalmers centrifugal pumps . . . all types for every purpose.

ALLIS-CHALMERS
MILWAUKEE

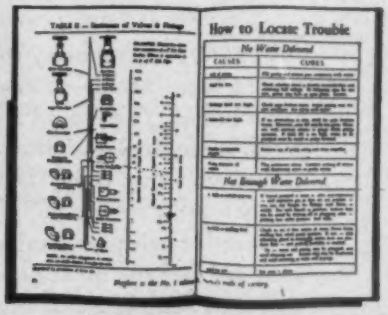
WE WORK FOR VICTORY · WE PLAN FOR PEACE

PUMPS NOW DO 4 TIMES THEIR NORMAL WORK - NEED THE FINER KIND OF CARE SET FORTH IN ALLIS-CHALMERS' NEW HANDBOOK!

EVERY EXECUTIVE, engineer and operating man should have a copy of this important new publication in his technical library. Pumps doing wartime work (8700 instead of 1800 hours a year) need *wartime care!*



To make principles of pump maintenance crystal-clear a pump is *built!*



Contents include valuable tables of friction losses, a guide to locating trouble, a maintenance timetable geared to *wartime!* Get *your* copy!

ALLIS-CHALMERS MFG. CO.
Milwaukee, Wisconsin

Gentlemen:
Yes, I would like to receive *free of charge* a copy of your "Handbook for Wartime Care of Centrifugal Pumps".

(Name)
(Title)
(Company)
(Street Address)
(City and State)

A 1583 C

Omaha Public Library
Reference Dept.

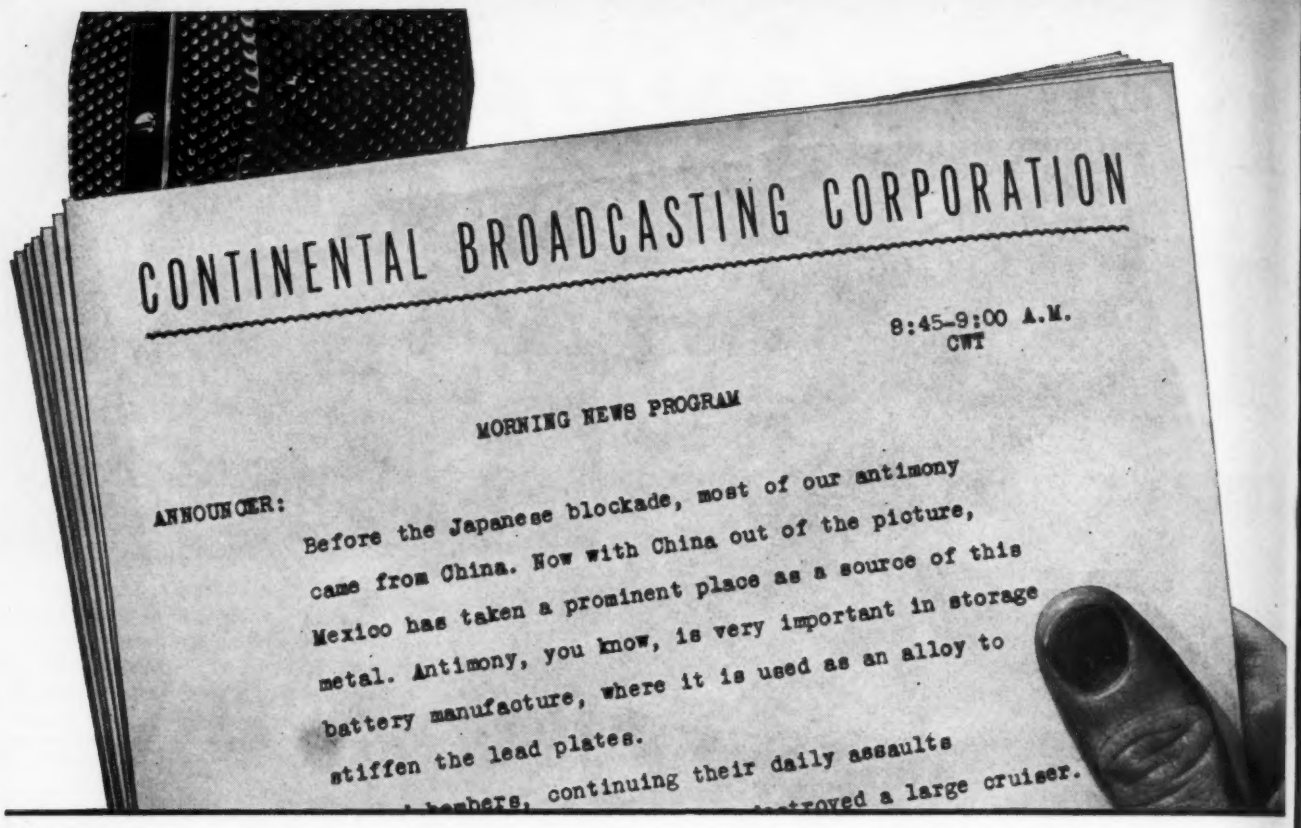

CONTINENTAL BROADCASTING CORPORATION
8:45-9:00 A.M.
CWT
MORNING NEWS PROGRAM
ANNOUNCER:
Before the Japanese blockade, most of our antimony
came from China. Now with China out of the picture,
Mexico has taken a prominent place as a source of this
metal. Antimony, you know, is very important in storage
battery manufacture, where it is used as an alloy to
stiffen the lead plates.
continuing their daily assaults
troyed a large cruiser.

Plate stamina is still "pre-war" in GOULD KATHANODE—your best choice for industrial trucks

WITHOUT antimony to stiffen them, the lead grids in Gould Kathanode—or any battery—would be as limp as fresh bread. The Gould factory is getting all of this vital metal it requires—another reason you can be sure that the Gould you buy today is the same high quality battery as always.

New batteries are available—but don't buy unless you have to! Get the most out of your present Gould Kathanode. Its spun glass construction introduced by Gould to American industry doubles battery life—which means that Gould Kathanode will last twice as long as ordinary batteries lacking this feature.

RATED CONSERVATIVELY...Goulds will equal or exceed in capacity any battery of comparable size and cell structure. Buy on proven performance and you'll buy Gould!

FREE HELP ON BATTERY PROBLEMS—*Your Gould Service Man will help you get full service from your present equipment, regardless of make. No charge, no obligation. Write Gould Storage Battery Corp., Depew, N. Y. Ask for FREE descriptive literature on any type of industrial installation.*

GOULD THE BATTERY PICKED BY ENGINEERS

Powerful ½" Heavy Duty Drill in Bench Drill Stand speeds up important drilling job in production of trailer fifth wheel turntables. Extra operation necessary before this Van Dorn Drill installation was made is now eliminated entirely.

VAN DORN *Power* PUSHES PRODUCTION UP 60%

THE Fruehauf Trailer Company is turning out thousands upon thousands of trailers to haul war cargoes for the Armed Forces and for war industry. Every precious production minute saved means just *that many more* vital cargo-carrying trailers. And Van Dorn *power* helps save some of these precious production minutes!

By using a ⅞" Heavy Duty Van Dorn Electric Drill for drilling holes in fifth wheel turntables, the company eliminated one time-consuming operation entirely . . . pushed up production on this drilling job 60%. Van Dorn power keeps it that way, too, 8 hours a day, 6 days a week!

Plant operators find that Van Dorn Portable Electric Tools are *powered right* for tough, non-stop operation . . . working with all kinds of materials in all sorts of new and different wartime jobs. They know that in case of a breakdown, there's a factory branch at hand ready to rush repairs or service. And factory men know that Van Dorn Jobbers are helpful in selecting the right tools for the job . . . no matter what it may be.

To show how ingenious adaptations of brains and Van Dorn Tools have solved some peculiar war production problems, send for our new FREE booklet, "They Used Their Heads"—just off the press. Your copy is waiting for you. Write your name and address on a card and mail to: The Van Dorn Electric Tool Co., 719 Joppa Road, Towson, Md.

"Van Dorn"

(DIV. OF BLACK & DECKER MFG. CO.)

PORTABLE ELECTRIC TOOLS

Get in the Scrap with Your Scrap

Omaha Public Library
Reference Dept.

Advance work by Sidney Birdseye, Ferguson man and international authority on "groundwork planning" saves both time and money.

FERGUSON PLANNING BEGINS BELOW GROUND

Prospective building sites are not always what they seem. Contours, drainage, earth strata, type of soil, bearing capacity, water levels—all must be carefully studied. Ferguson men get this information first hand and plan all foundation details *before* construction starts.

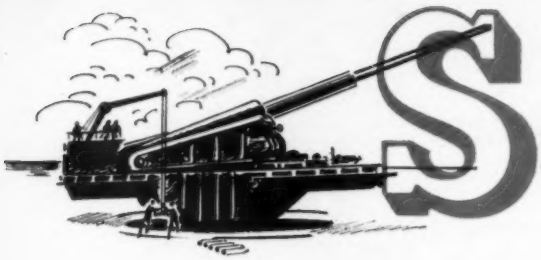
The same painstaking planning and attention to detail go into *every* phase of Ferguson work. That is why factories by Ferguson are well built.

Ferguson factories are delivered quickly—complete with equipment if you wish—ready to run. They are built to handle present needs efficiently—but with an eye to profitable post-war use. There is one contract, one responsibility, one profit. You assume no obligation in asking for consultation or estimates. Call either New York or Cleveland offices.

The H.K. Ferguson Co.

ENGINEERS AND BUILDERS

CLEVELAND **NEW YORK**



SLUGGING POWER

In more than 100,000 industrial plants dependable Dayton V-Belt Drives harness the horsepower on which depends the slugging power of America's flaming steel

Around the clock, these cool-running Dayton V-Belts transmit smooth-flowing power for every kind of job. They're operating under high speeds and shock loads; they're doing the job in excessive temperatures, and under dust, moisture and abrasive conditions.

Rugged, long-life Daytons save time, protect machinery, cut power losses and reduce maintenance to a negligible minimum. What's more, these strong, flexible, built-to-bend Dayton V-Belts operate on short centers and permit more output and more machinery per square foot of floor space.

Located nearby to serve your wartime needs is a Dayton Distributor whose stock of V-Belts is supplemented by strategically located factory warehouses. So for service—or for helpful suggestions regarding the conservation of V-Belts through proper application and maintenance procedure—call your nearest Dayton Distributor.

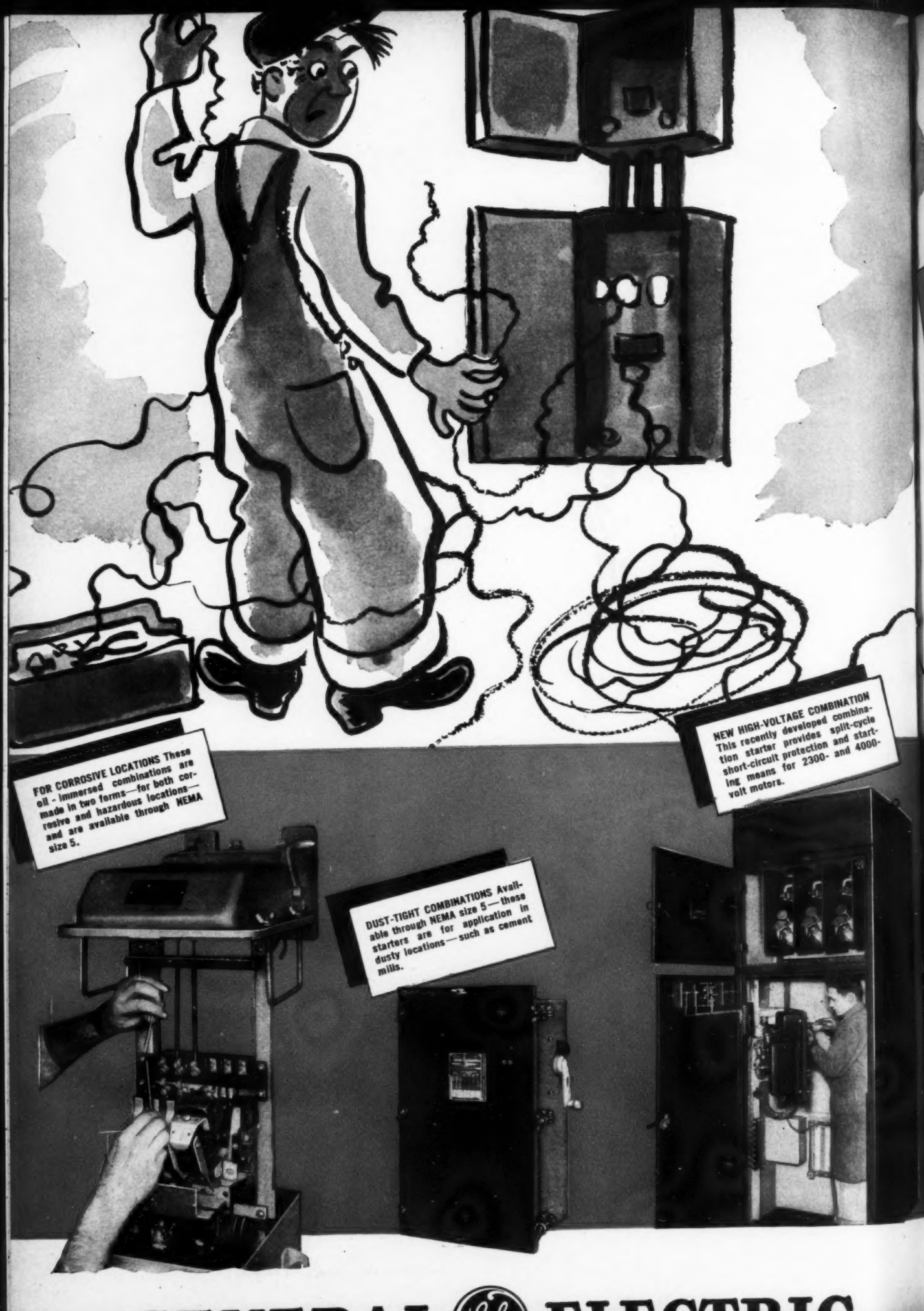
THE DAYTON RUBBER MFG. CO.
The World's Largest Manufacturer of V-Belts
DAYTON, OHIO

DAYTON RUBBER EXPORT CORPORATION
38 Pearl Street, New York, N. Y. U. S. A.

THROW YOUR SCRAP INTO THE FIGHT!
BUY WAR BONDS AND SAVINGS STAMPS

Dayton V Belts
LIFELINES OF POWER VITAL TO VICTORY

THE GREATEST NAME IN V-BELTS


FOR CORROSIVE LOCATIONS These oil-immersed combinations are made in two forms—for both corrosive and hazardous locations—and are available through NEMA size 5.
DUST-TIGHT COMBINATIONS Available through NEMA size 5—these starters are for application in dusty locations—such as cement mills.
NEW HIGH-VOLTAGE COMBINATION This recently developed combination starter provides split-cycle short-circuit protection and starting means for 2300- and 4000-volt motors.
GENERAL ELECTRIC

HEY BILL!
YOU'RE DOUBLING YOUR WORK WHEN YOU INSTALL CONTROL THAT WAY!
EVER HEAR OF G-E COMBINATION MOTOR STARTERS?
By using G-E combination starters, you can cut the time required to install motor control by 50 per cent. That's because "combinations" combine two controls—a motor-circuit switch (with short-circuit protection) and a magnetic starter—in one, compact, easy-to-mount unit.
But that isn't all—combination starters save critical material by eliminating unnecessary conduit; they offer your operators better protection because the case door is interlocked with the safety switch; and help you save valuable plant space by putting all necessary motor control in one case.
The next time you order motor control, save man-hours and critical material by specifying General Electric combination starters. They are available for motors from 1 to 1000 horsepower. General Electric Co., Schenectady, New York.
WATERTIGHT COMBINATIONS For outdoor application and for installation in damp locations—these starters are available through NEMA size 5.
FOR HAZARDOUS LOCATIONS Enclosed in a high-strength, alloy case, these starters are ideal for Class 1, Group D, locations. They are available through NEMA size 4.
FOR GENERAL-PURPOSE USE Available up to and including NEMA size 5—these combinations are for indoor applications where atmospheric conditions are normal.
COMBINATION STARTERS FOR MOTORS FROM 1 TO 1000 HP

GENERAL ELECTRIC

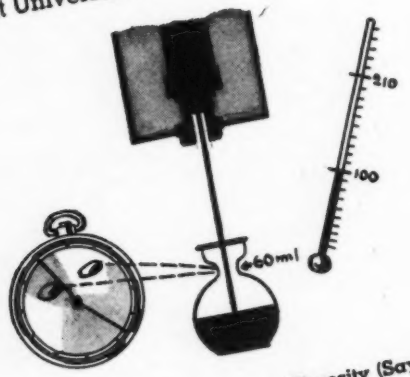
VISCO

TIDEWATER LUBRICANTS

DEFINITION: The resistance to distortion offered by a fluid, because of its cohesion or internal friction, is called Viscosity. A heavy bodied slow pouring liquid is high in viscosity.

TEST: The commercial instrument commonly used in the United States for determining viscosity of mineral lubricating oils is the Saybolt Universal Viscosimeter (S.U.V.). The viscosity, expressed in seconds (Saybolt Universal), is the time required for 60 milliliters of the liquid to flow through the standard aperture of the instrument at a stated temperature.

The Saybolt "Furol" Viscosimeter is often used in connection with very heavy oils. Multiply Furol seconds by 10 to obtain approximate Saybolt Universal seconds.



Examples	Viscosity (Saybolt Universal) at 100°F	at 210°F
Kerosene	32 sec.	40-50 sec.
Light Machine Oils	150-250 sec.	150-250 sec.
Steam Cylinder Oils	2000-6000 sec.	

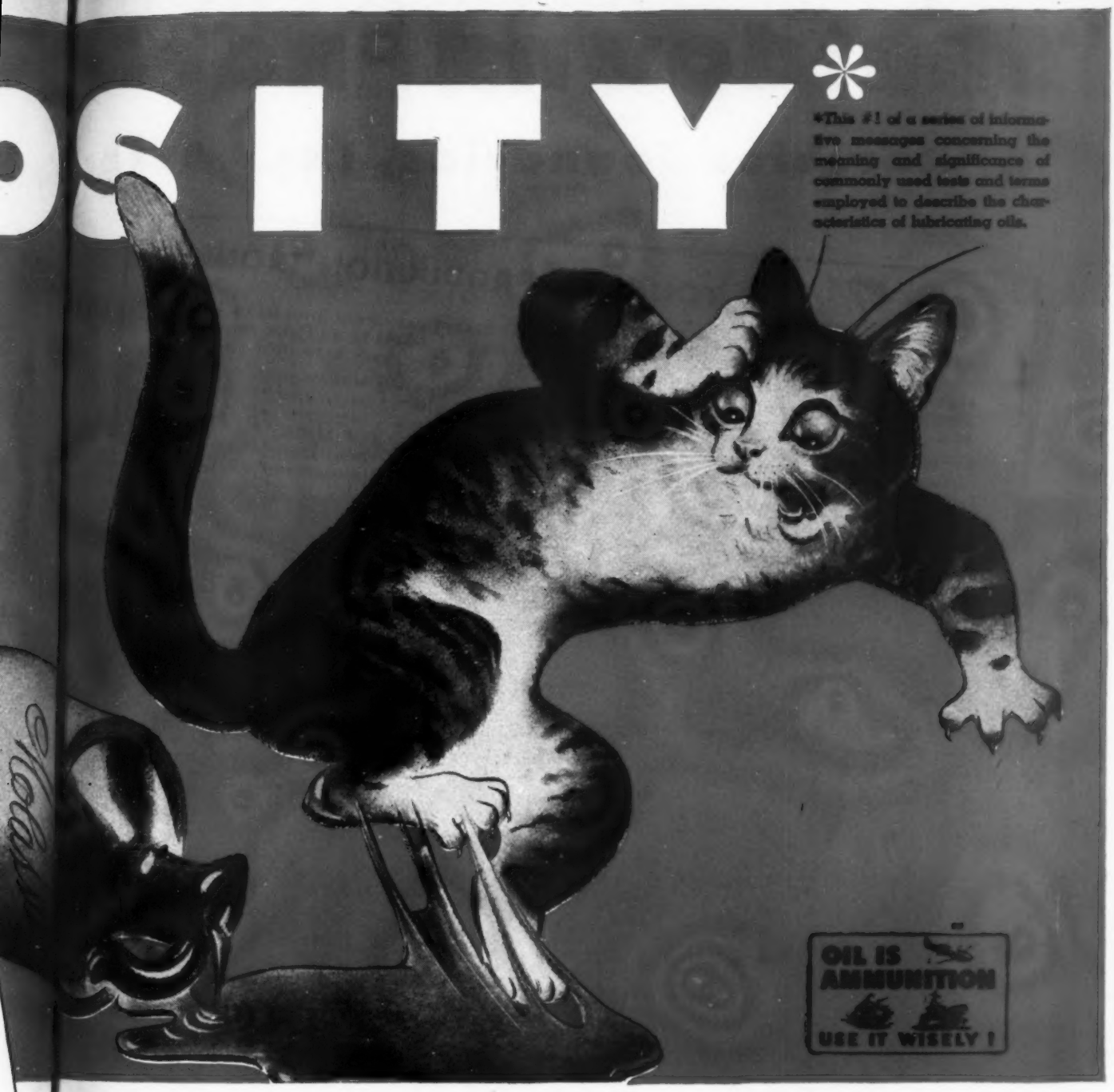
INDUSTRIAL TYCOL OILS-GREASES

DRUMS! DRUMS! DRUMS!
War needs make it extremely important that all empty drums be returned immediately.

TYCOL
SCIENTIFICALLY

OSITY*

*This #1 of a series of informative messages concerning the meaning and significance of commonly used tests and terms employed to describe the characteristics of lubricating oils.



Tycol lubricants are manufactured to definite, predetermined viscosities. Each Tycol lubricant when used for the recommended purpose provides correct viscosity at the operating temperature. This accomplishes complete separation of the rubbing surfaces by a film of oil for their protection, yet without needless drag from excessive fluid friction. This is but one of many tests that assure unvarying high quality in Tycol lubricants.

TIDE WATER ASSOCIATED OIL COMPANY

Eastern Division: 17 Battery Place, New York • *Principal Branch Offices:* Boston, Philadelphia, Pittsburgh, Charlotte, N. C.

MAKERS OF THE FAMOUS VEEDOL MOTOR OIL

INDUSTRIAL LUBRICANTS

ENGINEERED FOR EVERY INDUSTRIAL USE

"Shutdowns Ended

at Hercules Foundries, Inc., After

Read This, IF YOU HAVE PRODUCTION TROUBLES

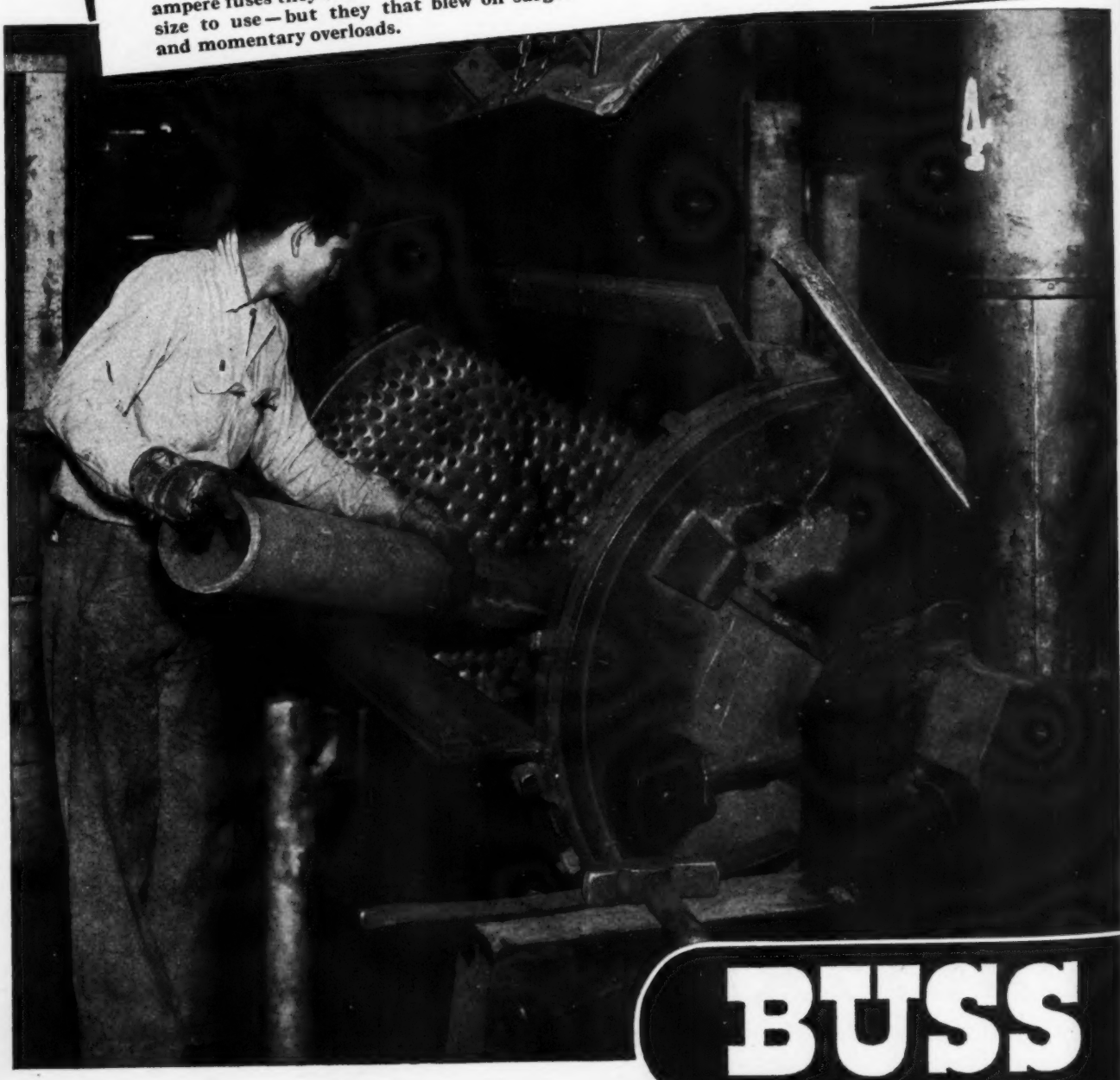
"About a year ago, Hercules Foundries Inc., 5950 S. Boyle Ave., Vernon, Calif., complained that frequent fuse blows were shutting down their ball mill and interfering with production.

"We investigated and found that the 50 ampere fuses they were using were the proper size to use—but they that blew on surges and momentary overloads.

"We figured that if the fuses had a longer time-lag they would be all right. 50 ampere BUSS Super-Lag fuses were then installed.

"They put an end to these shutdowns and Hercules Foundries haven't any more such production losses."

L. J. Meller,
Meller Electric Company,
Huntington Park, Calif.



BUSS

On This Ball Mill we Installed BUSS FUSES"

Says Electrical Contractor L. J. Meller of Huntington Park, Calif.

THERE'S a profitable moral in Mr. Meller's experience at Hercules Foundries, Inc. It's another example of preventing interruption of production schedules by using Buss Super-Lag fuses. It's definite proof that fuse blowing on harmless overloads is unnecessary and need not be tolerated.

Buss fuses require no maintenance or periodic inspection. They don't open needlessly. If one opens, you can be sure some condition needs correction. When one opens, it requires less than 45 seconds to renew with an inexpensive link.

Here is why BUSS fuses greatly reduce or entitely prevent needless blows

The fuse case is designed to insure good contact on the link, even when the fuse is renewed by an inexperienced person—and it is so designed that vibration or heavy overloads or the constant heating and cooling of the fuse will not permit poor contact to develop. Thus excessive heating which causes fuses to blow needlessly is prevented.

The fuse link used is the famous "BUSS Super-Lag." It has lag-plates attached to it. These give it a long time-lag so that unusually heavy starting current or other harmless overloads will not cause the fuse to blow.

How to solve the "shutdown problem"

Pass the word along that all purchase records dealing with circuit protective devices should be immediately changed to call for BUSS Super-Lag Renewable fuses. Then, as fuses are replaced or new installations made, your plant will automatically get the benefit of the carefree, trouble-proof protection that BUSS Super-Lag fuses afford.

BUSSMANN MFG. CO., University at Jefferson
St. Louis, Missouri *Division McGraw Electric Company*

10 FEATURES
in the design of the FUSE-CASE help make it possible.
The SUPER-LAG
development in the FUSE-LINK completest he job.

Super-Lag FUSES SOLD THROUGH WHOLESALERS

SOLD FIRST

A YEAR OLD BABY NOW MAKES ITS

Thor

1/4" ELECTRIC DRILL

WITH HOUSINGS OF

THORITE PLASTIC

Check these **OUTSTANDING ADVANTAGES**

- **MORE POWER PER POUND**
- **LIGHTER**
- **COOLER TO HANDLE**
- **STRONG and STURDY**
- **COMPACT**
- **GREATER PROTECTION FROM SHOCK**

Under Army Contract for almost a year, Thor plastic-housing 1/4" Electric Drills now are available for general distribution.

OUT OF THOR LABORATORIES a year ago this April, there came the first successful 1/4" electric drills to appear on the market with housings of "THORITE" Plastic. First sale on these machines, went, naturally, to Uncle Sam. The Army, a year ago this May, contracted for them—and a companion machine made of pressed steel—in an unheard of quantity. Into immediate production went these new "THORITE" plastic drills to be supplied in ever-increasing numbers for duty all over the world.

Pioneered by Thor, they were the first successful major electric tool development to conserve aluminum. Actual, day-after-day use has PROVED that these Thor "plastic" drills can take it and stand up under the toughest conditions to provide dependable performance and more power per pound than any other heavy-duty 1/4" electric drill on the market today! Modernly designed with the entire case made of new, strong, specially-developed "THORITE" plastic, these Thor drills are lighter, cooler to handle, safer, sturdy and powerful.

With current military requirements nearing completion, these Thor "plastic" drills are now available to war industries.

TO UNCLE SAM!

PUBLIC APPEARANCE!

"Thorite" GEAR CASE COVER

Held in position with metal protection nut threaded directly to inner metal skeleton frame and locked against metal centerplate.

These "THORITE" plastic drills are powered by the famous Thor hevi-duty motor; have "Silent Type" over-size fan to provide abundant ventilation; and over-size pitch, alloy-steel gearing for efficient power transmission.

"Thorite" FIELD CASE

Slides over skeleton frame, is held in keyed position against metal centerplate and locked by grip handle which is securely screwed to inner metal frame.

Bearings, gears, stator, armature, centerplate and other internal power unit parts are supported on a sturdy, inner metal skeleton frame to insure close tolerance in alignment of working members.

"Thorite" GRIP HANDLE

Slides over end of inner metal frame, is held securely against field case in keyed position and locked directly to inner frame by screws.

The plastic housing does not support any working members of the machine, but serves simply as a protective covering for the inner, independent assembly of the tool.

Thor *Portable Pneumatic and Electric Tools*

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO, ILL.

Branches in Principal Cities

ARMY E NAVY

THOR'S 50th YEAR

drills are now available to war industries.

Longer Life for Every Bearing *Because:*

All ROLLWAY RADIAL BEARINGS are Free from Thrust Loads

All ROLLWAY THRUST BEARINGS are Free from Radial Loads

PILE a thrust load on a roller bearing that's already carrying a radial load and you introduce complex stresses that tend to force the rollers from the race . . . that tend to increase sliding friction and wear-back between the roller ends and the radius of the race . . . and that tend to cause earlier fatigue failure.

That's why Rollway Solid-Cylindrical Roller Bearings split every load into its two simplest components of *pure* radial and *pure* thrust . . . carrying each of these on separate roller assemblies at RIGHT ANGLES TO THE ROLLER AXIS. Both torque per bearing and load per roller are substantially reduced. You get greater roller cross-section and greater roller contact area per unit of load, hence more strength to meet stress, and less hazard of spalling and brinelling the race.

You can usually change over from other bearings to Rollways of higher load capacities without increasing boundary dimensions. But, for maximum life and service, your bearings should be carefully chosen as to size and type. Send us your drawings, or a description of your application, for free and confidential bearing recommendation.

For longer bearing life, more efficient performance and more economical maintenance . . .

FOLLOW THIS BASIC BEARING PRINCIPLE

- All radial loads carried at right angles to the roller axis.
- All thrust loads carried at right angles to the roller axis.

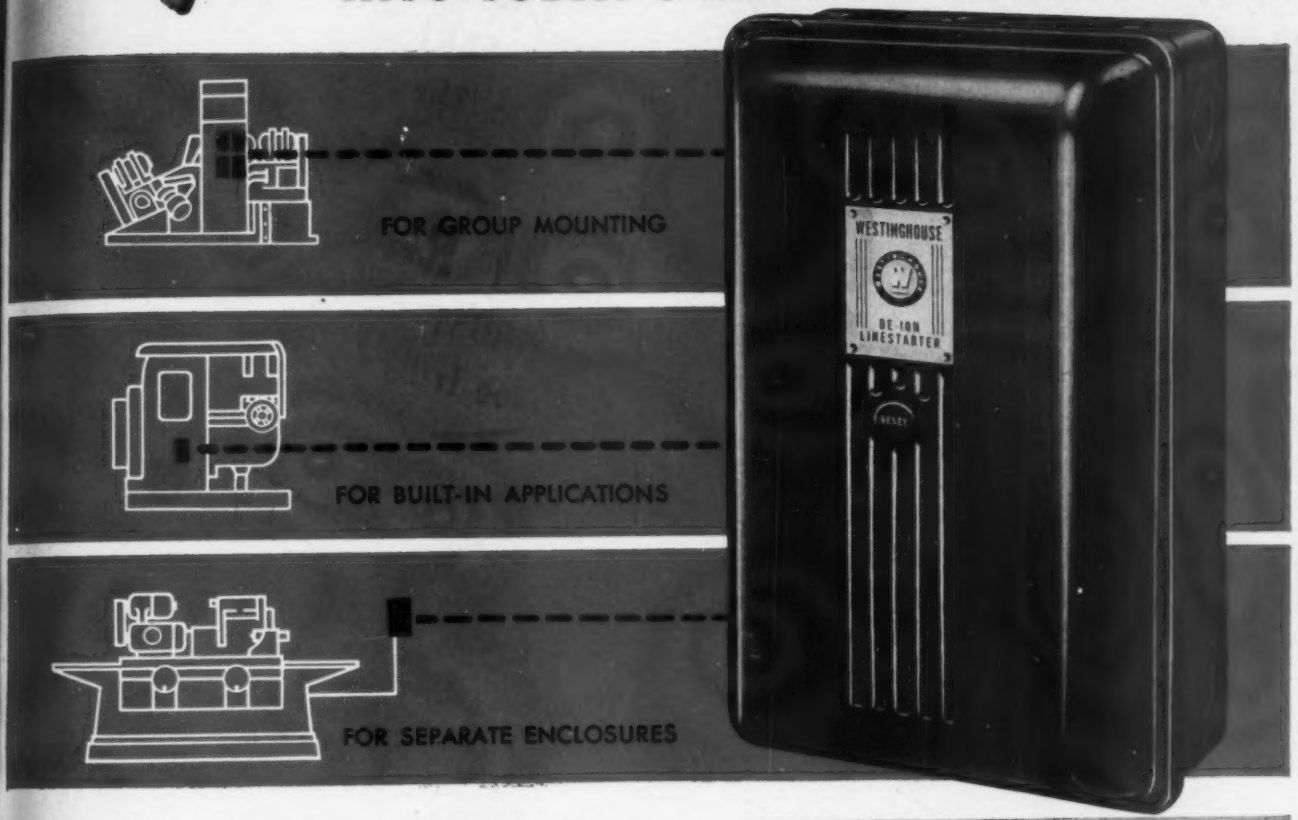
ROLLWAY BEARING COMPANY, INC., SYRACUSE, N. Y.

BUILDING HEAVY-DUTY BEARINGS SINCE 1908 **BEARINGS**

NEW LINESTARTER

FITS PERFECTLY

INTO TODAY'S MACHINE TOOL PICTURE



Both in size and performance, this new Linestarter measures up to the requirements of modern machine tool design for compactness, easy mounting and dependable, trouble-free operation.

It is compact—ideal for group mountings and built-in applications. No crowding—all parts are quickly front-accessible.

It is flexible—coil is front-removable. Overload relay may be adjusted for either manual or automatic reset.

Sturdy and efficient, it is designed to give across-the-line starting, stopping, and overload protection under grueling 3-shift schedules. The armature is self-aligning—features a knife-edge bearing of nitrided steel that guarantees positive, accurate contact alignment. Service life of contacts is greatly increased by new, double-break construction.

Ask your Westinghouse representative for further details or write for Bulletin 3185. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N. J-21254

NEW DESIGN FEATURES

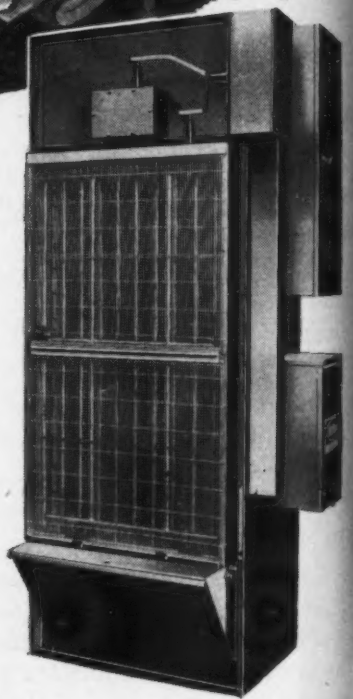
SIZE 2 LINESTARTER

for A. C. polyphase motors up to 15 hp, 220 volts; 25 hp, 440, 550 or 600 volts

- **"De-ion" arc quenching—prolongs the contact life.**
- **Hand or automatic reset Bi-metal overload relay.**
- **Knife-edge bearing—an exclusive Westinghouse feature.**
- **Interlocks—space for as many as four.**

Westinghouse MOTORS AND CONTROLS

DEFEATING ONE OF OUR GREATEST ENEMIES OF PRODUCTION



Until the advent of war with its rigid demands for increased production, the control of industrial atmospheric and process dusts was considered desirable, but not vital. However, War has changed many things! Today, *Dust Engineering* has assumed its rightful place as an essential part of *production planning.*

The importance of *Dust Engineering*—protecting materials in process, reducing rejects, increasing worker efficiency and reducing maintenance costs — is fully attested by the fact that we have delivered *over 3 times* the AAF equipment last year as during any similar period in our history!

If you have a troublesome or dangerous dust condition in your plant, write us about your problem. Send for "AAF In Industry", new booklet describing the complete line of AAF equipment.

At right — The automatic-electrostatic filter which removes up to 97% of all dust particles from the air — including smoke and fumes.

AMERICAN AIR FILTER CO., INC., 361 Central Avenue, Louisville, Kentucky

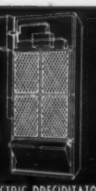
In Canada: **Darling Bros., Ltd., Montreal, P. Q.**

AMERICAN AAF AIR FILTERS

SELF-CLEANING AIR FILTER

AIRMAT DRY FILTER

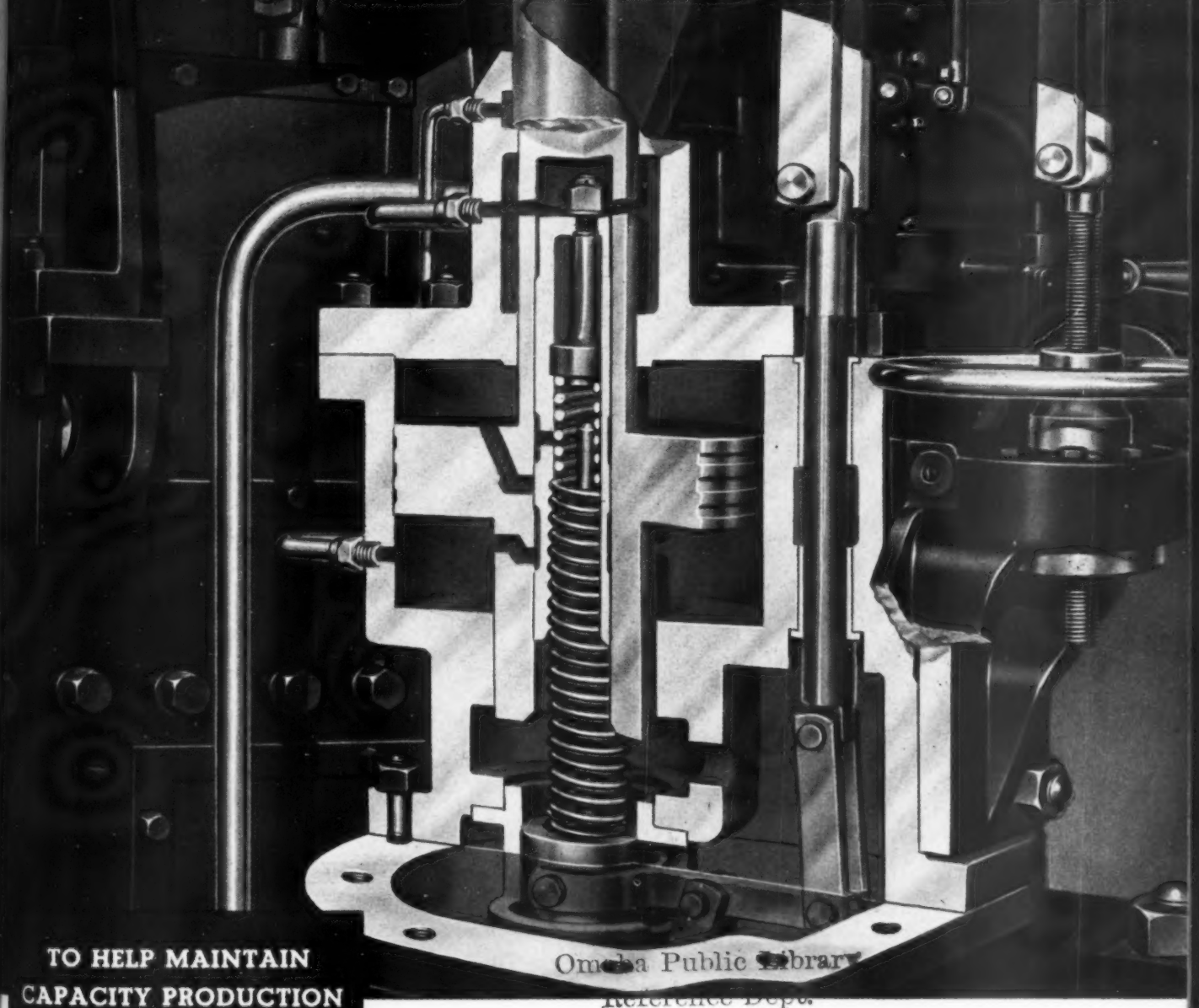
AIRMAT DUST ARRESTER


ELECTRIC PRECIPITATOR

ROTO-CLONE PRECIPITATOR

Speed Cop for 20,000 "Horses"—

WORKS BEST WITH THE RIGHT OIL!



Omaha Public Library
Reference Dept.

TO HELP MAINTAIN CAPACITY PRODUCTION CALL IN

SOCONY-VACUUM

GARGOYLE Lubricants *for Correct Lubrication*

YOU'RE LOOKING INSIDE the speed governor of a 20,000 horsepower turbine. As the turbine spins out its power, this "speed cop" never sleeps.

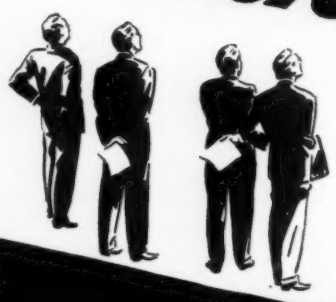
Those pipes you see carry *oil* in and out of the governor. When the turbine speed varies, the oil pressure in the pipes changes and that cut-away piston moves up or down. This regulates the steam fed to the turbine . . . keeps its speed constant.

This miraculous device depends on the *right* oil. For the oil lubricates the turbine bearings, too. There heat and air might oxidize it... cause the pipes to clog... let the horsepower "run away"!

For years, over 50% of U.S.A.'s major-sized turbines have used a Gargoyle oil. For *all* equipment no finer lubricants are made than those branded *"Gargoyle"!* Production-harried management today depends on them for an uninterrupted flow of wartime material.

SOCONY-VACUUM OIL CO., INC.—Standard Oil of New York Div. • White Star Div. Lubrite Div. • Chicago Div. • White Eagle Div. • Wadhams Div. • Southeastern Div. (Baltimore) • Magnolia Petroleum Company General Petroleum Corp. of California

Read the WAR NEWS before it happens



Tomorrow's battle headlines are being written in today's production records. And wherever Veeder-Root Counting Devices are installed, these records are being published continuously, in bold black-and-white figures. So any bad news can be corrected long before it gets into serious trouble . . . trouble that so often develops where there is no constant, accurate Control-by-Count.

For all types of war-production machines, you can get Veeder-Root Counting Devices . . . mechanically or electrically operated . . . to count in any terms or units of performance required. And any of these counters can be installed quickly and easily, without disrupting production. If your work counts in war production today, then help to make the war news good tomorrow. *Count on Veeder-Root.*

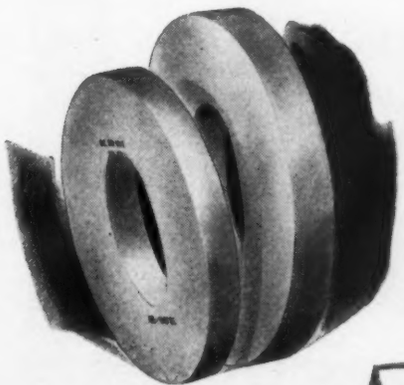
Keep War-Production Machines in Step... equip them with VEEDER-ROOT COUNTERS

VEEDER-ROOT INC., HARTFORD, CONNECTICUT, U. S. A.

What's the hottest spot in a Dog Fight ?

A pilot may keep cool in a "dog fight"—but not his engine! And to function smoothly at high engine temperatures all moving parts must be ground and finished with split hair precision. And that's where Carborundum comes in. For instance, the valve stems are ground to the required accuracy by a centerless grinding process which Carborundum helped develop.

The centerless grinder grinds the valve stems to an accuracy of five ten-thousandths of an inch. Does it, too, in half the time other finishing methods would require. Carborundum has led in the development of centerless grinding wheels to speed the output of valves, pistons, shafts and other such parts that go into a plane.



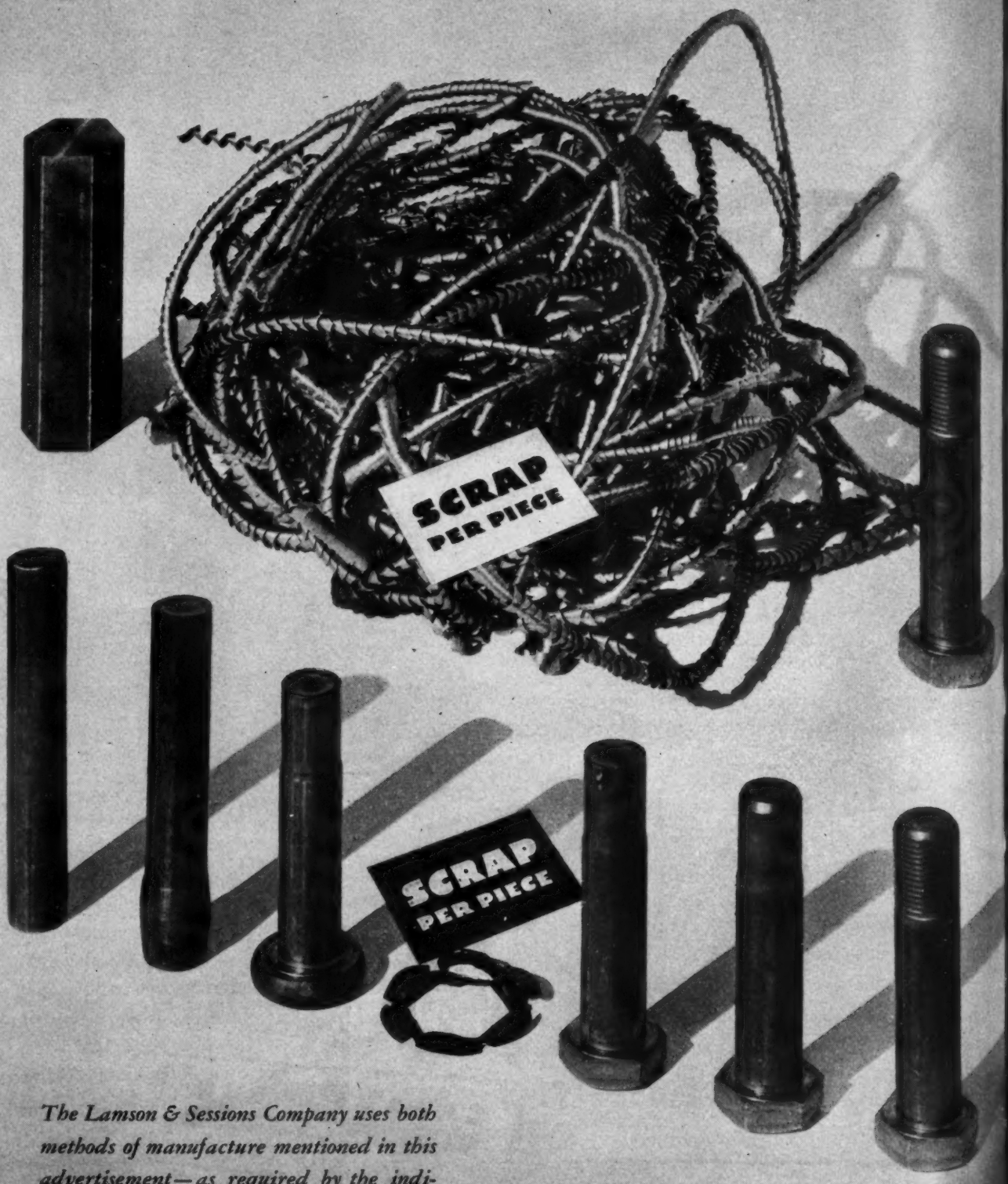
Because of the vital part grinding plays in war production, correct care and use of grinding equipment is a wartime must. Every grinding wheel is a "Weapon for Production" and should be properly used for maximum effectiveness. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
Reg. U.S. Pat. Off.
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

One Way to Save Steel

. . . AND THIS IS ONE



The Lamson & Sessions Company uses both methods of manufacture mentioned in this advertisement—as required by the individual specifications of the customer.

...is to produce less scrap

...WAY YOU CAN DO IT

This is an actual, practical, everyday example of how cold forging (upsetting) conserves raw materials and reduces scrap.

We realize that the difference in scrap produced in just this one common bolt product shows up in a startling way to you. However, you can be sure that this is not "trick" photography or in any sense a fake or exaggeration, for here are the facts relating to this photograph. The example shown at left is a ¾ x 6" S. A. E. hexagon head cap screw.

Weight of Finished Bolt per 1000 pieces, 849 lbs.	Milled from the Bar	Made by Cold Forging
Raw Material Required	1639 lbs.	880 lbs.
Total Scrap Loss	759 lbs.	31 lbs.
Amount of raw material saved per 1000 pieces by upsetting method		728 lbs.

In short, excepting for the bit of metal trimmed off the head of the cap screw made by the upsetting method, *there is no scrap produced.* Since the weight of 1000 pieces of these head trimmings is only *31 lbs.,* the scrap loss that is measurable in production is less than *.031 lbs.* per bolt!

And obviously, the scrap loss in producing this same bolt by milling from the bar is 0.759 lb. per piece, *or about 25 times as much!*

That is why we can say that if a part that is made on a screw machine can be produced by the upsetting method you will save raw materials. Since heading and threading today is done to very close tolerances and with a minimum of scrap, it is extremely important to remember this when every pound of steel is "ear-marked" for a purpose—*to win the war.*

But that is not the only reason why, in war production, you should consider upsetting as a method opposed to a milled-from-the-bar product. Here are two more excellent reasons.

1. If a part now made on a screw machine can be made by upsetting, you can release a machine tool badly needed to make another part which can only be made by a screw machine!
2. Upsetting and threading a part, compared with producing the same part on a screw machine, is generally many times faster, and in every way as satisfactory or more satisfactory as the milled product.

There are still other good reasons why upsetting may solve a problem for you—and of course the relative importance of each reason we present will vary with your position in war production.

3. You can specify upset products with a reasonable expectation of getting better deliveries, without sacrificing standards of accuracy, strength or finish. (Please refer to the photograph. Upsetting uses *round* wire for the part, which is more readily available, and less expensive, than *cold hexagon drawn* bar stock used by the milling process.)
4. Accuracy and finish? The aviation industry is now using products made by the upsetting method, which meet every laboratory test and the most exacting inspections.
5. Lamson & Sessions make cap screws with a minimum tensile strength of 150,000 lbs. psi in diameters up to and including ½-inch; up to 125,000 lbs. psi in diameters over that! *A smaller bolt made by modern bolt practise will often* PROVIDE ALL THE STRENGTH YOU WANT but will require much less material—and the saving of material thus gained can be put to other war production purposes.

Engineering departments less familiar than Lamson & Sessions' engineers with these facts given you, can confidently come to *bolt specialists* for help—for our experts in bolt production are able and willing to give you correct information on your problems, and without obligation.

THE LAMSON & SESSIONS COMPANY, 1971 W. 85th St., Cleveland, O.

These four books will help you in specifying and buying "standard" bolts, nuts and "specials"

THE LAMSON BLUE BOOK—is our complete Catalog of standard products excepting our Aircraft products.

"BOLTS, NUTS & SCREWS"—70 pages of technical and practical information. First copy gratis, requested on your letterhead. Additional copies $1 each.

"BOLT, NUT & RIVET STANDARDS"—175-page book published by the American Bolt, Nut & Rivet Manufacturers Association, 1550 Hanna Bldg., Cleveland, Ohio. Price one dollar per copy. *(Order from publisher, please.)*

"SIMPLIFIED STOCK LIST"—Of bolts, nuts and screws, conforming to latest revisions of the Office of Price Administration, and of great value in showing you in what ratio quantities of various standard products are kept in stock for deliveries, by your jobbers and in our own (and other bolt manufacturers') warehouse stocks.

LAMSON & SESSIONS

BOLTS · · NUTS · · COTTERS · · CAP SCREWS · · SPECIALS

Your Jobber Stocks the Lamson Line

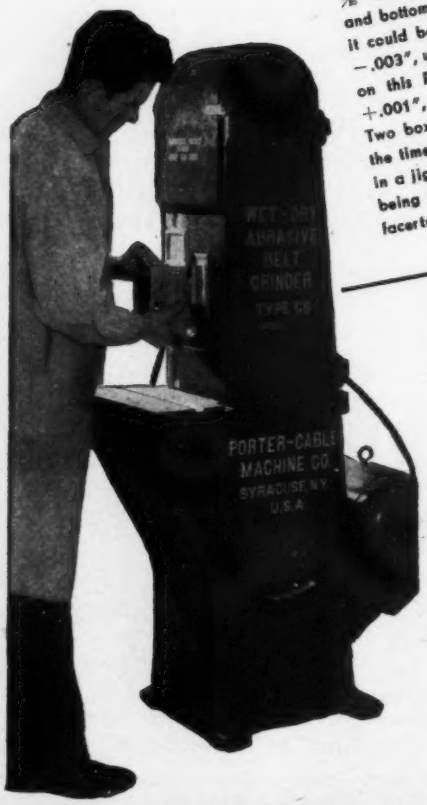
Memo to Management:

Nine Times Faster than a Miller on this Job!

PORTER-CABLE

Wet-Belt SURFACER... Model G-8

Here's a 3" x 8" manganese box with a ⅜" wall, that had to be machined flat top and bottom to close tolerances. The closest it could be held by milling was +.002", −.003", using a jig. FREEHAND surfacing on this Porter-Cable machine resulted in +.001", −.001" variation from true flat. Two boxes were finished in this manner in the time an operator took to lock a piece in a jig for milling. Now, NINE boxes are being turned out on a G-8 Wet-Belt Surfacer to ONE on the regular milling machines.



This is just one job that versatile Porter-Cable Wet-Dry Belt Surfacers can do faster and better than ordinary millers, shapers or grinders. Other examples in actual production show speed-ups ranging from 5 to 50 times faster than previous operations. In aircraft plants—in toolrooms—in armament production lines, this amazing new machining method is speeding production and taking over many jobs from work-jammed machine tools of other types.

Everywhere it's been tried Porter-Cable Wet-Dry Belt Surfacing is *proving* its value in time and labor savings . . . whether working on hard or soft metals, plastics, fibre, compositions. Try it—watch the diamond-hard high-speed abrasive belt produce true, uniform, fine-finished surfaces, either flat or curved. And Wet-Belt Surfacing eliminates chances of heating, discoloring, warping, dust . . . safely handles inflammables. You owe it to the war-effort—to your plant—to your men to investigate the *speed with accuracy* of Porter-Cable Wet-Belt Surfacing. SEND RIGHT NOW FOR OUR NEW BOOKLET—showing war-production applications that are important information for Method Engineers, Superintendents, Foremen.

Unskilled Operators . . . Women Workers, Get Speed with Accuracy

—Releasing skilled workers for more intricate jobs, getting new high production levels from inexperienced operators, is a demonstrated result with Porter-Cable Wet-Belt Surfacers.

PORTER-CABLE MACHINE CO.

2150-3 N. Salina St., Syracuse, N. Y.

Simplified paper work speeds up production..

Mimeograph duplication eliminates wasteful rewriting and turns out sharp, permanently legible copies.

CASE HISTORY

Here is how one company recently made a notable saving in man-hours with the use of the Mimeograph duplicator.

Their paper work for production orders, identification cards, and progress records *was reduced to a single writing on* Mimeograph brand stencil sheet. The required number of copies for each form are run off easily, in a matter of minutes:

6 to 15 copies of production orders—one for each department that works on this part, plus one for production planning department . . . *6 to 500 copies of identification cards*—one for each "tote" box or pan . . . *2 copies of progress records*—one for the production department and one for the schedule follow-up.

Further savings in man-hours are realized *by the permanent legibility of these copies.* Mimeograph equipment produces sharp, clean highly readable copies that do not smear or fade in spite of rough handling.

If this case history applies to your own paper work problems, feel free to write for full details and actual samples. Address A. B. Dick Company, Chicago.

Mimeograph duplicator

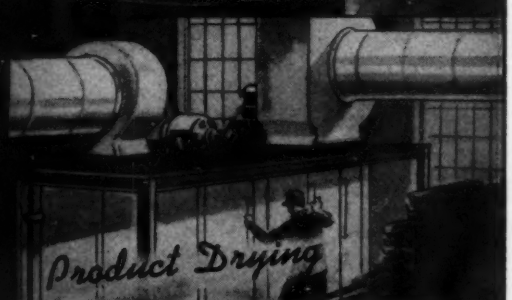
MIMEOGRAPH is the trade-mark of A. B. Dick Company, Chicago, registered in the U. S. Patent Office.

The standard of speed and legibility in the one-writing system

Individual units of equipment or complete control systems, for maintaining the desired temperature and humidity required for any manufacturing operation.

Systems for collecting and exhausting all kinds of air-borne hazards—dust from machining or polishing operations; fumes from processing tanks; steam, vapor or excess heat that hampers production.

All types of fan equipment or individually engineered systems, to meet each specific ventilating problem with the utmost efficiency and economy.



Custom-designed-and-built drying equipment of the unit or continuous type, to obtain exactly the characteristics desired in drying an endless variety of raw materials and finished products.

HOW A SHELL

THE CASING of this long, slim, deadly missile started life as a homely hunk of brass. But you can't take these slabs of brass and—presto!—turn them into shell casings. They're rough, bumpy—need a shave—before they can be drawn into smooth, glistening casings. So these shell cases in embryo—great rectangular planks of solid brass, 10 feet long, a foot wide and 2 inches thick—go to the "barber shop". Sharp, whirling milling cutters go to work, trimming off literally mountains of brass "Whiskers" or chips.

If allowed to accumulate, these chips would quickly overwhelm shop, machines and men. Here is a job for Air at Work . . . a hurricane of air, harnessed by a Sturtevant pneumatic conveying system. Heavy metal chips as well as heat and smoke are whisked away . . . metal is reclaimed . . . busy machines are kept cool for continuous work . . . men are more efficient . . . work is speeded.

This is another of those *yesterdays of pioneering* that are bringing Victory closer today. First developed for a Connecticut Brass Mill in 1910, similar slab milling chip exhaust systems are now at work in the foremost ammunition plants in the country. And it's just one of countless ways that Sturtevant is supplying the know-how and equipment to make Air serve the war effort.

Air Conditioning, Ventilating, Drying, Heating, Dust and Fume Control, Mechanical Draft . . . in designing and building these *precision* installations, we have learned many wartime ways to put air to work more *efficiently.* And we have unearthed many new developments that will make air an even greater ally of industry when Victory is won.

B. F. STURTEVANT CO., HYDE PARK, BOSTON, MASS.
Branch Offices in 40 Cities
B. F. Sturtevant Company of Canada, Limited—Galt, Toronto, Montreal

STURTEVANT—FOUNDER OF THE AIR HANDLING INDUSTRY

Sturtevant Systems AND EQUIPMENT

REG. U. S. PAT. OFF.

CASE GETS SHAVED AT BIRTH!

Sturtevant
REG. U. S. PAT. OFF
Puts Air to Work

Engineered for Precision VENTILATING, HEATING, AIR CONDITIONING, DRYING, DUST AND FUME CONTROL, PNEUMATIC CONVEYING, MECHANICAL DRAFT

BORN TO KEEP A DATE *behind the enemy's lines!*

Official Photograph, U. S. Army Air Forces

"Objective below—cut loose!" Towlines go slack. Suddenly the gliders are on their own—huge, motorless craft floating silently to earth—each with a cargo of fighting men.

"Vertical envelopment" your military strategists call this new offensive tactic. And to make it work, aircraft plants the nation over are set up to turn out swarms of troop-carrying gliders—giant transports born to keep a date behind the enemy's lines.

At Taylorcraft, at Aeronca, at Piper, at Waco, at Pratt-Read and other plants that will make these gliders for America's new air-borne infantry, it is significant that modern paint-spraying systems by DeVilbiss have been installed to reduce the time required for wing doping and other finishing operations.

Today, in practically *all* war production, DeVilbiss Spray Systems are making possible better, quicker coating, painting and finishing jobs.

Tomorrow, when this war has been won, the new spray techniques and equipment we are developing to meet the requirements of war production will provide faster, more efficient finishing for your peacetime products.

THE DEVILBISS COMPANY • Toledo, Ohio

Canadian Plant: WINDSOR, ONTARIO

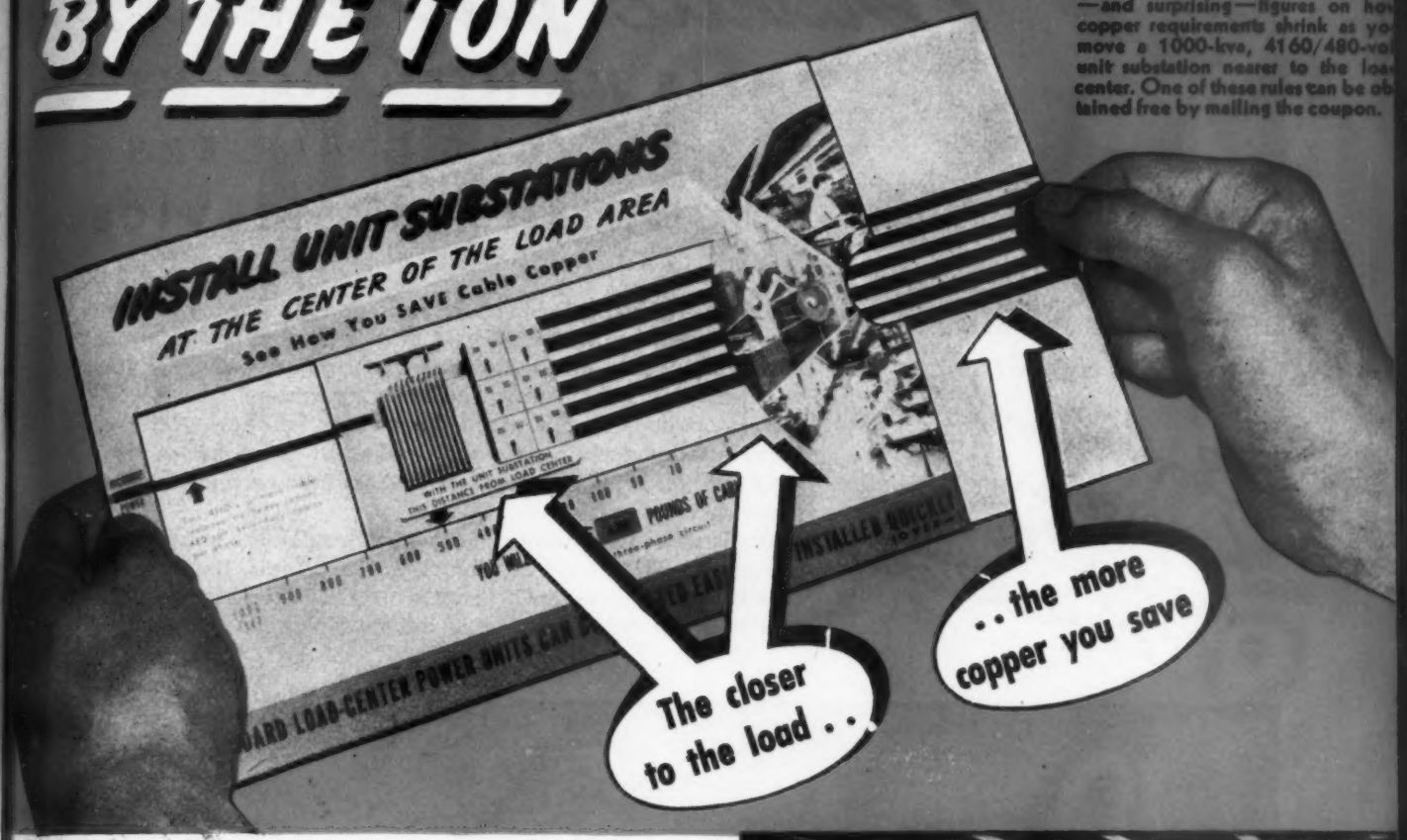
PROUD to have won the coveted Army-Navy "E" for excellence in war production, the men and women of DeVilbiss pledge to continue giving their all-out best—for Victory.

DEVILBISS SPRAY SYSTEMS

SPRAY EQUIPMENT • EXHAUST SYSTEMS • AIR COMPRESSORS • HOSE & CONNECTIONS

HOW TO SAVE COPPER BY THE TON

This "slide rule" gives you actual —and surprising—figures on how copper requirements shrink as you move a 1000-kva, 4160/480-volt unit substation nearer to the load center. One of these rules can be obtained free by mailing the coupon.


INSTALL UNIT SUBSTATIONS
AT THE CENTER OF THE LOAD AREA
See How You SAVE Cable Copper
The closer to the load . .
. . the more copper you save

PUT UNIT SUBS AT THE LOAD CENTER TO SHORTEN SECONDARY RUNS

Compact, load-center unit substations *installed right at the load center* save tons and tons of copper by replacing long, secondary runs with small-size primary cables.

These "packaged" unit substations are so safe and compact that they can be placed right in working areas, in relatively valueless space along column centers, on sub-balconies, or over washrooms. Because of their location adaptability, you don't have to worry about last-minute rearrangements of machinery. "They go anywhere the load can."

Standard Factory-assembled Units

You don't have to spend weeks writing bulky specifications either. You can select complete, integrated substations for your needs from a line of *standard factory-assembled units*. They arrive all ready to be set in place and connected—at the spot where they take the least copper and do the best job.

For further information on load-center unit substations, call or write the G-E office nearest you. *General Electric Company, Schenectady, N. Y.*

GENERAL ELECTRIC

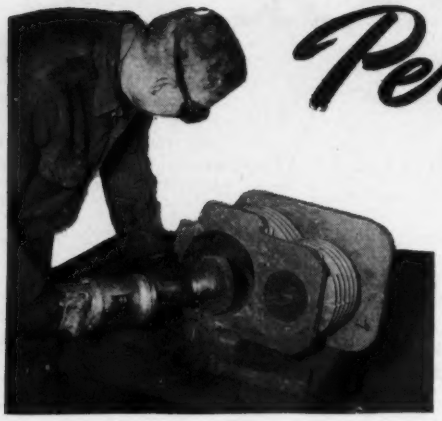
Standard, "packaged" load-center unit substations include Pyranol transformers, and metal-enclosed drawout air-breaker equipments for control and protection of the low-voltage feeders. The drawout breakers can be readily withdrawn for quick, easy inspection, and can be replaced by a spare in only a few minutes.

General Electric, Section C 302-17
Schenectady, N. Y.

Please send me those checked:

- Load-center "slide rule"—GES-3043
- "Five Ways to Save Copper"—GED-1011
- "Quickly Installed Electric Power Systems"—GED-1006

Name.....
Company.....
Address.....
City..... State.....



Periodic Lubrication,

SIMPLE MAINTENANCE, KEEP CP HICYCLE GRINDERS IN CONTINUOUS SERVICE

Cool-running, Long-service Tools assured by Four Precautions

CP Hicycle Electric Grinders have long been known for their low maintenance costs — lowest of any type of portable tool. But, even CP Hicycles will give better service, with minimum of repair time if they are given ordinary care.

Here are four simple suggestions which will help you keep Hicycle Grinders in continuous service. Do these things regularly and you will cut repair time to the minimum and conserve strategic materials.

While these illustrations show a CP grinder, the suggestions are applicable to most CP Hicycle Electric Tools. Detailed recommendations on other CP Hicycle and Universal Electric Tools will be given in future advertisements. Watch for them.

HOW TO GET MAXIMUM SERVICE FROM YOUR CP HICYCLE GRINDERS

1 Clean out gear case once a month and fill with grease two-thirds full. Too much will cause churning action and get into motor.

2 Keep the ventilation openings free of dirt. Once a month—more frequently under dusty conditions—blow out openings with air hose.

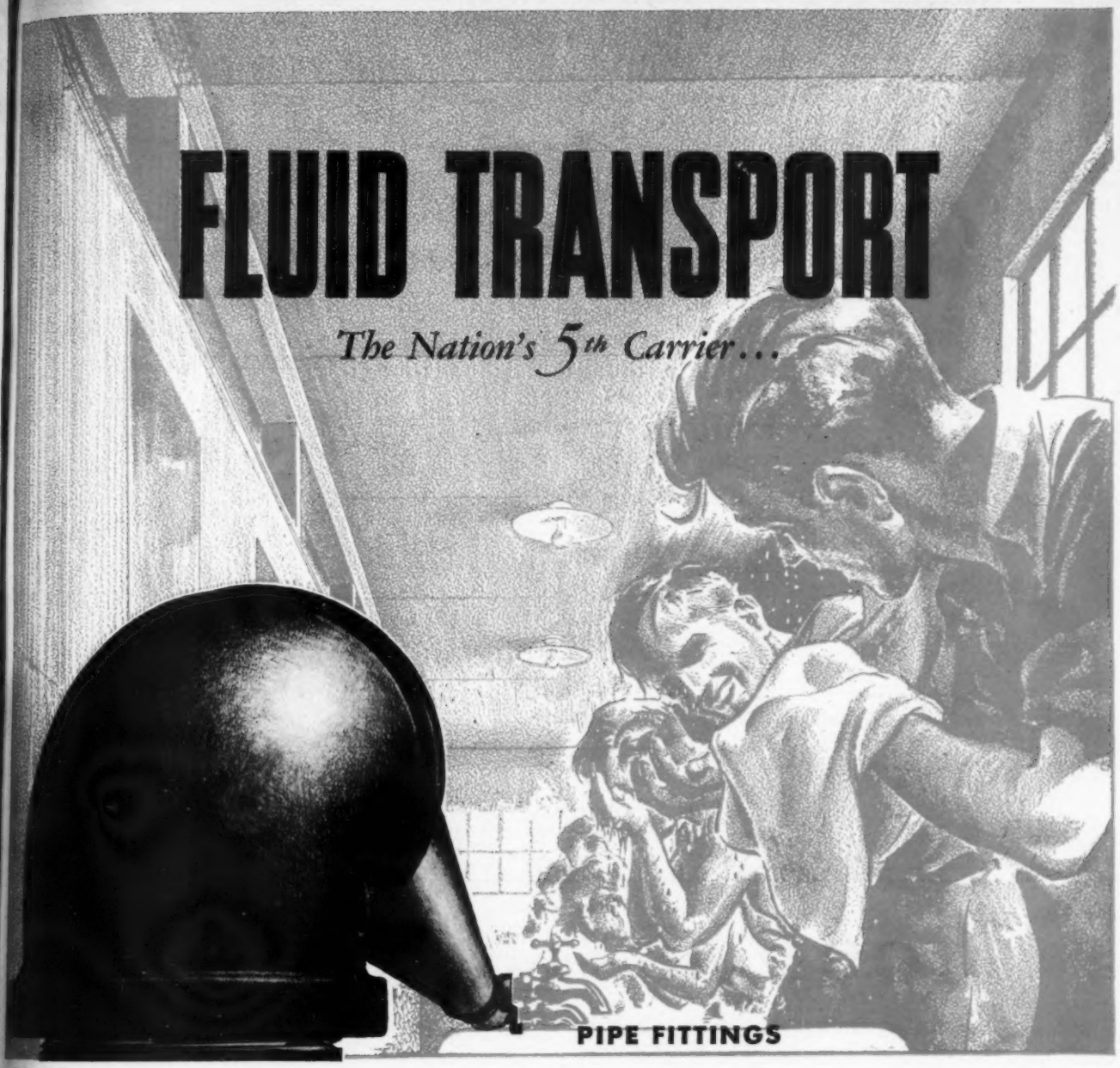
3 A hot tool indicates overloading, too much grease or too little grease. Check temperature of housing by touching it frequently.

4 A good precaution with all electric tools. Always keep rubber cables free of grease and oil, otherwise they will swell and rot.

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY
General Offices: 8 East 44th Street, New York, N. Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES



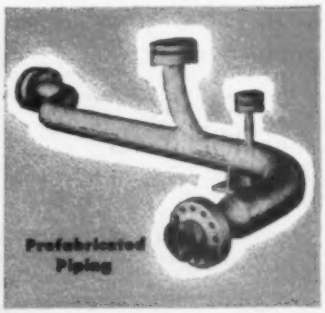
WASHING 50,000 FACES is a major job of FLUID TRANSPORT. Imagine the complexities of the piping systems for water, heat and sewerage in an army camp to house and train many thousands of recruits. Yet these systems have been installed on "impossible" time schedules.

Piping systems like that define the true function of Grinnell FLUID TRANSPORT, which includes the supplying of all the connecting links for converting a pile of pipe into a complete *piping system.*

For new war construction, or maintenance and repair of existing piping, call Grinnell Company, Inc., Executive Offices, Providence, Rhode Island. Plants and offices throughout United States and Canada.

GRINNELL

WHENEVER **PIPING** IS INVOLVED



is YOUR office in this fix today?

Mounting office work and a shrinking office staff . . . more paper work, more accounting, more reports to fill out—and a skeleton office force, loyally struggling to carry the load.

There is an answer: call the Remington Rand technical specialist. He is a veteran with long experience and specialized knowledge of accounting, bookkeeping, tabulating, control systems and general office methods. His suggestions can help you get wider use, and more work, out of your priceless office machines and equipment. For instance:

▶ He can point out short-cuts in accounting work, so that your office machines will give you capacity production.

▶ He can show you wartime record control methods, and can furnish you visible record equipment and files.

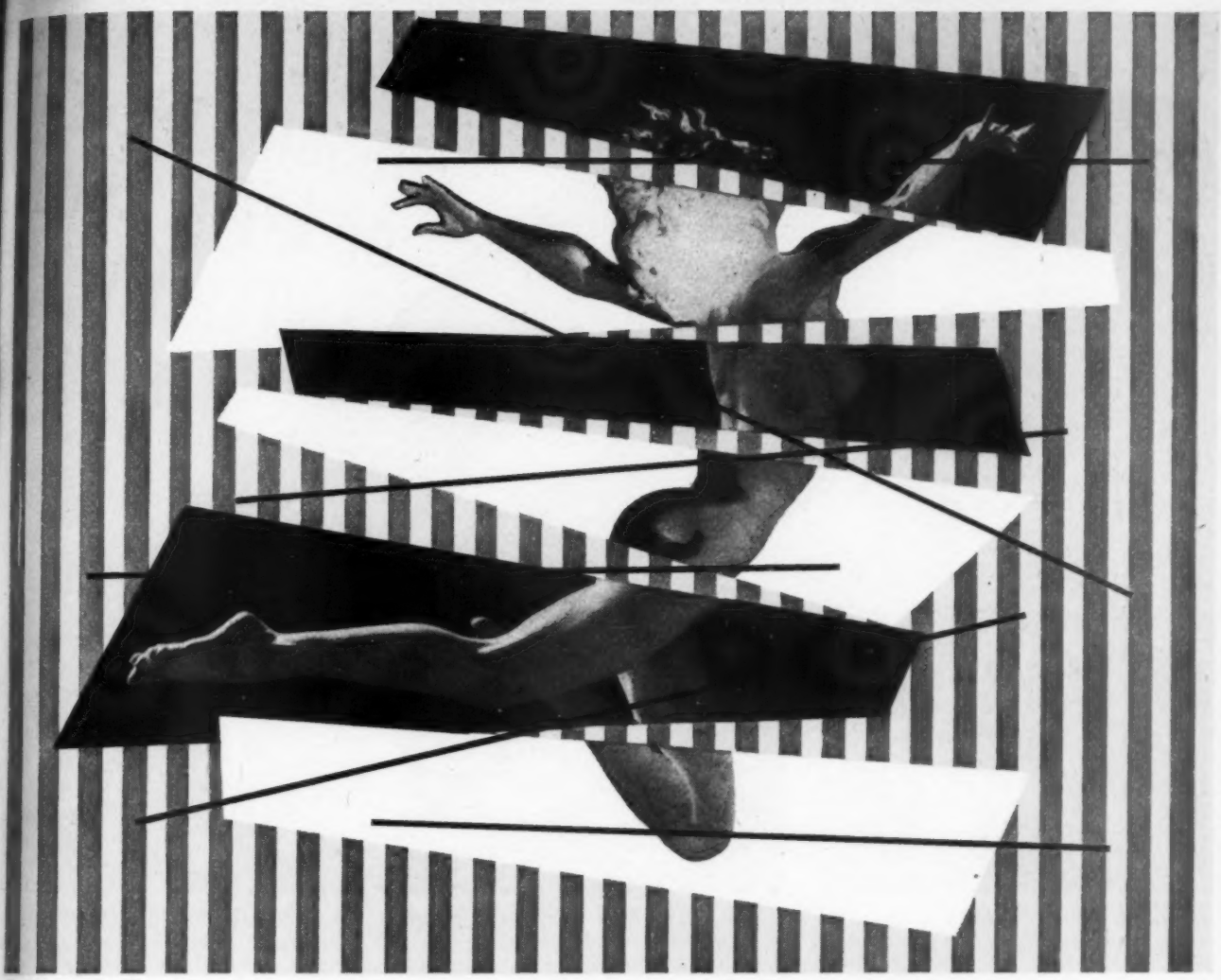
▶ He can explain simple rules for taking care of your office machines so that they will give uninterrupted service.

▶ He can still furnish your necessary office supplies—file folders, duplicator stencils, typewriter ribbons, carbon paper, and many other supplies—all of dependable Remington Rand quality.

Call the Remington Rand technical specialist. He's as near to you as your telephone. Ten thousand war plants are already using his service to help speed the production of war materials. He may help you win your Battle of Production.

Remington Rand

WAR PRODUCTS: *Airplane propellers . . . aircraft parts . . . bombsights . . . guns . . . machine gun parts . . . auxiliary aircraft motors . . . radio special equipment . . . torpedo parts . . . shells . . . fuzes . . . ammunition loading . . . and many others.*



This machine can be improved!

THE HUMAN BODY, we've all been told, is the most perfect machine ever devised. Poets, doctors and engineers all agree on this point.

Yet even the human body is capable of change and improvement. Take life expectancy, for example. Less than 100 years ago it was 35 years...today, it is 63.3! And our soldiers today are 2 inches taller and 14 lbs. heavier than they were during the last war.

The important thing about these figures is this: No matter how highly developed a machine may be...no matter how miraculous its accomplishments may seem, never make the mistake of assuming it cannot be improved. Mistakes like this have caused the failure of more than one flourishing business!

The machine tool industry is busy today making machines to make the 45,000 parts of bombing planes, 40,000 parts for tanks, and the multiple parts and instruments for ships, cannon, rifles, torpedoes and shells. And as a result of wartime experience, even such highly developed machines as Cone Multiple Spindle Automatic Lathes will surely be improved.

Cone Automatics are now being used to help build instruments of war. But in the peace to come, they will again be dedicated to building a better, brighter world.

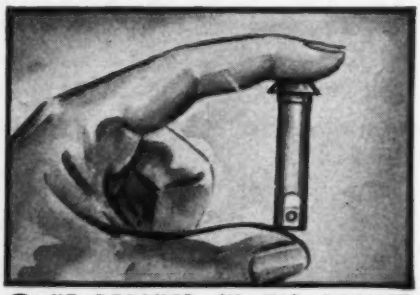
CONE Automatic Machine Company, Inc., Windsor, Vermont

"WHO'D HAVE THOUGHT THE END OF A PIN COULD KEEP ME HAPPY!"

1 IT WAS BACK IN 1939—We had to put a new drive on one of our machines over in the part of the plant we called the "dust bowl." We decided to try a chain belt to see if we could get a more positive drive. It looked as though it would stand the gaff, but I was a bit cynical.

2 WE WORKED IT NIGHT AND DAY—If ever a drive took punishment, that new chain belt did. We kept the machine going continuously under the worst possible abrasive conditions. The boys hardly had a chance to keep the chain oiled. It sure looked good, but I kept my fingers crossed.

3 AND STILL NOTHING HAPPENED—That chain belt kept right on running as smooth as silk. It got to be nothing unusual for it to be on the job 20 hours a day—what with the rush of war production. Honestly that machine got to be the talk of the plant. The boys called it Old Faithful.



Side Bars of High Carbon or Alloy Steel.
Carbon or Alloy Steel Pins, Riveted or Pin and Cotter Construction.
Three-Diameter Pin for Easy Assembly.
Selected Steels Are Used in These Rollers.
Hardened Bushings Locked in the Side Bars.
Accurate Pitch Assured by Close Tolerances.

4 SO I ASKED THE REX MAN FOR the secret—"Why is it," I said, "that this Rex Chabelco chain belt is giving us so much better service than any of our others? Do you Chain Belt fellows have a better way of making things than other folks? What's the secret, anyway?"

5 HE REACHED IN HIS POCKET and pulled out a pin—a pin from a Rex Chabelco chain belt. He showed how the milled flat ends of this pin keep it from turning in the side-bar and working loose. This Rex design naturally gives the chain belt far longer life.

6 WOUND UP WITH THIS DIAGRAM—This Rex man admitted that other things besides the pin made this chain so great—side bars of a special steel, bushings case-hardened, and on and on. I was sold to the hilt on this chain. They know how to *make* things at Chain Belt!

Not only does Chain Belt make over 2000 types and sizes of chain belts for transmission of power, movement of material and timing operations—but it has a distributing organization that makes its products quickly available to you. Call the Rex man or write 1667 West Bruce St., Milwaukee, Wis.

REX CHAIN BELTS

CHAIN BELT COMPANY OF MILWAUKEE

Rex Conveying and Engineering Products Division, Rex Chain Belt and Transmission Divison, Milwaukee, Wisconsin
Baldwin-Duckworth Chain Belt Division, Springfield, Mass.; Worcester, Mass.

REX CHAIN BELT COMPANY

Electrical failure somewhere in your plant may be more imminent than you think . . . .

WARTIME restrictions make copper products hard to get—this includes electrical wire and cable. It will pay you to protect what you have.

Anaconda's Preventive Maintenance Plan will help you check to see that cables in your plant are not being abused . . . to detect electrical weaknesses that can be corrected.

If you follow this free plan you not only help yourself, but more important, you help the war effort. This manual provides a practical automatic method for complete analysis of circuits and equipment...uncovers potential weaknesses . . . methods for correcting them . . . with charts to enable quick periodic check-ups.

NOTE: Through this Preventive Maintenance Plan you may uncover the evidence necessary to obtain an "emergency repair priority." This is explained fully in the plan book.

"Tomorrow may be too late . . . do it today!"

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

Anaconda Wire & Cable Company
25 Broadway, New York City

Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding production.

Individual.....

Company.....

Address.....City.....

3R

"Its features assure even more efficient steel cutting

"Our shop has just discovered the answer to one of its problems . . . the new KENNAMETAL Clamped-on tool. This clamped-on tool combines freedom from brazing strain with longer shank service and provides our boys with a lathe tool that will outlast several conventionally styled tools.

"The illustration above shows new features which solve problems that have plagued our shop for a long time. We have found even the earlier style clamped-on tool to be valuable especially on shell turning jobs, but we were forced to insert shims to block-in the tip as it was moved out on the shank. The new KENNAMETAL Clamped-on tool, however, utilizes a screw which is adjusted easily and holds the tip firmly whether it is a new tip or has been shortened by several regrinds.

"The clamp, on previous styles of clamped-on tools, was raised considerably above the tool tip and inhibited the most efficient handling of the tool. At times it also obstructed desired chip flow. This new tool clamps the tip in place through use of a screw inserted through the bottom of the shank and up through the clamp; this method eliminates the need for any projection above the clamp itself.

"Another good point is, that we can make these 'Holders' of heat treated SAE 1045 in our own shop and each holder will outwear several carbide tips which are easily and quickly replaced. As the tips become smaller after regrinds, they are moved out to a new cutting position and backed up with the hardened set screw. When the tip becomes too small to clamp effectively, it can be brazed to a shank in the conventional manner and entirely used up.

"We think the best practice is to withdraw the tools at definite production intervals, before excessive wear occurs. This lengthens overall tool life, since it is then necessary to remove only a few thousandths of carbide.

"Grinding wheels cut faster and last longer on regrinding these clamped-on tools, too. They grind only on the carbide and don't load up like they do grinding shank steel.

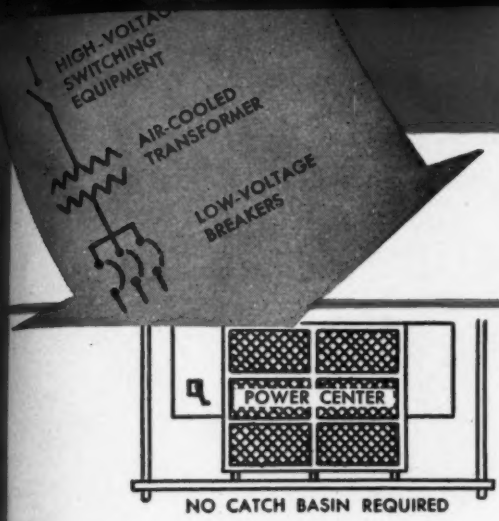
"One set of KENNAMETAL grade KM tips in clamped-on tools used in our shop has turned more than 3,000 155 mm. shells, and of all the tips we have used, each has consistently turned out more than 2000 shells during the life of the KENNAMETAL tip. It is because of performances like this that we are using more and more of these new Clamped-on KENNAMETAL tools."

For complete information about clamped-on and other standard styles of KENNAMETAL tools write for the new KENNAMETAL Tool Manual.

*INVENTED AND MANUFACTURED IN U. S. A.

McKENNA METALS Co.
130 LLOYD AVE., LATROBE, PA.
Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
(Exclusive of Canada and Great Britain)
Trade Mark Reg. U. S. Pat. Off.

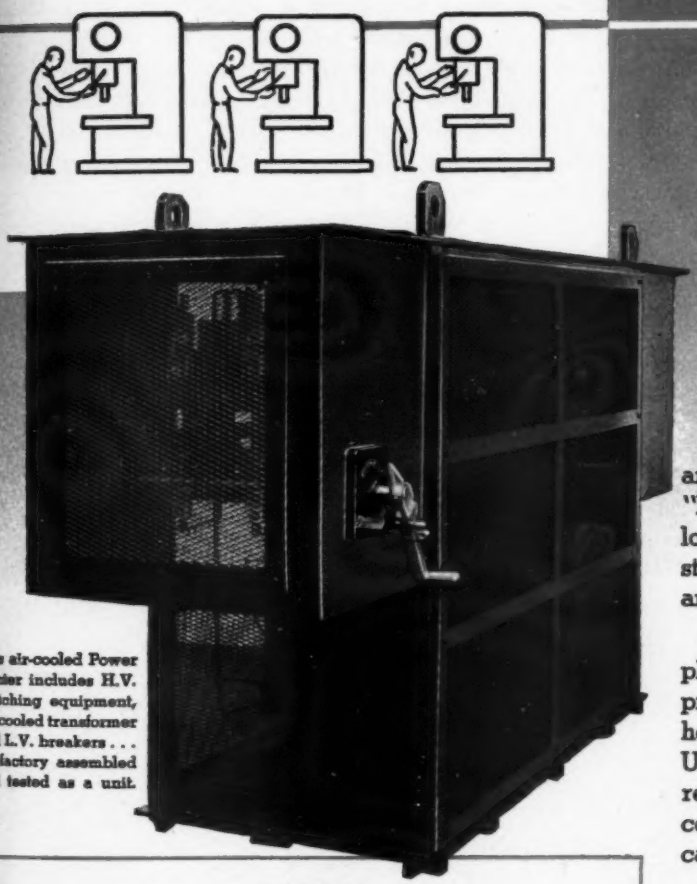
KENNAMETAL THE All American CARBIDE



Nearer the Load Center
to improve voltage regulation

. . . and power
anywhere you need it
in a hurry

with Westinghouse
Power Centers



This air-cooled Power Center includes H.V. switching equipment, air-cooled transformer and L.V. breakers . . . all factory assembled and tested as a unit.

Power centers are available for installation anywhere . . . indoors or outdoors! They are "Packaged Power" to supply concentrated loads. Unit construction saves man-hours in installation and production time because all units are factory assembled and tested.

Westinghouse Power Centers have been applied in all types of Industrial Plants and are proving ideal in office buildings, apartment houses, air bases, Navy Yards, and Army Camps. Used near the load center, they improve voltage regulation and often save more than 75% of the copper otherwise required for long secondary cables.

Power Centers are available with oil, Inerteen, or air-cooled transformers; high-voltage fuses, disconnect switches or selector switches; low-voltage panelboards, breakers or throat-connected, low-voltage switchgear.

Air-Cooled and Inerteen Power Centers can be mounted overhead to save floor space . . . with perfect safety to workmen below.

Ask your Westinghouse representative for complete information, or write Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-70400

FEATURES

- Factory assembled and tested
- Low installation cost
- Less copper
- Better regulation
- Safe
- Attractive
- Minimum space
- No vaults required*

ADDED ADVANTAGES OF AIR-INSULATED POWER CENTERS

- Fire hazard is eliminated. Transformer is completely air-cooled. No cooling or insulating liquids of any kind.
- Explosion hazard is eliminated.
- Toxic gas hazard is eliminated.
- Inspection and maintenance are reduced to a minimum.

**National Electric Code permits air and Inerteen-insulated units to be installed indoors without fireproof vaults.*

Westinghouse
POWER CENTERS

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

NO PREVIOUS WAR EVER SAW A ROAD-BUILDING JOB LIKE THE NEW ALCAN HIGHWAY...

nor the modern *Preformed wire rope*

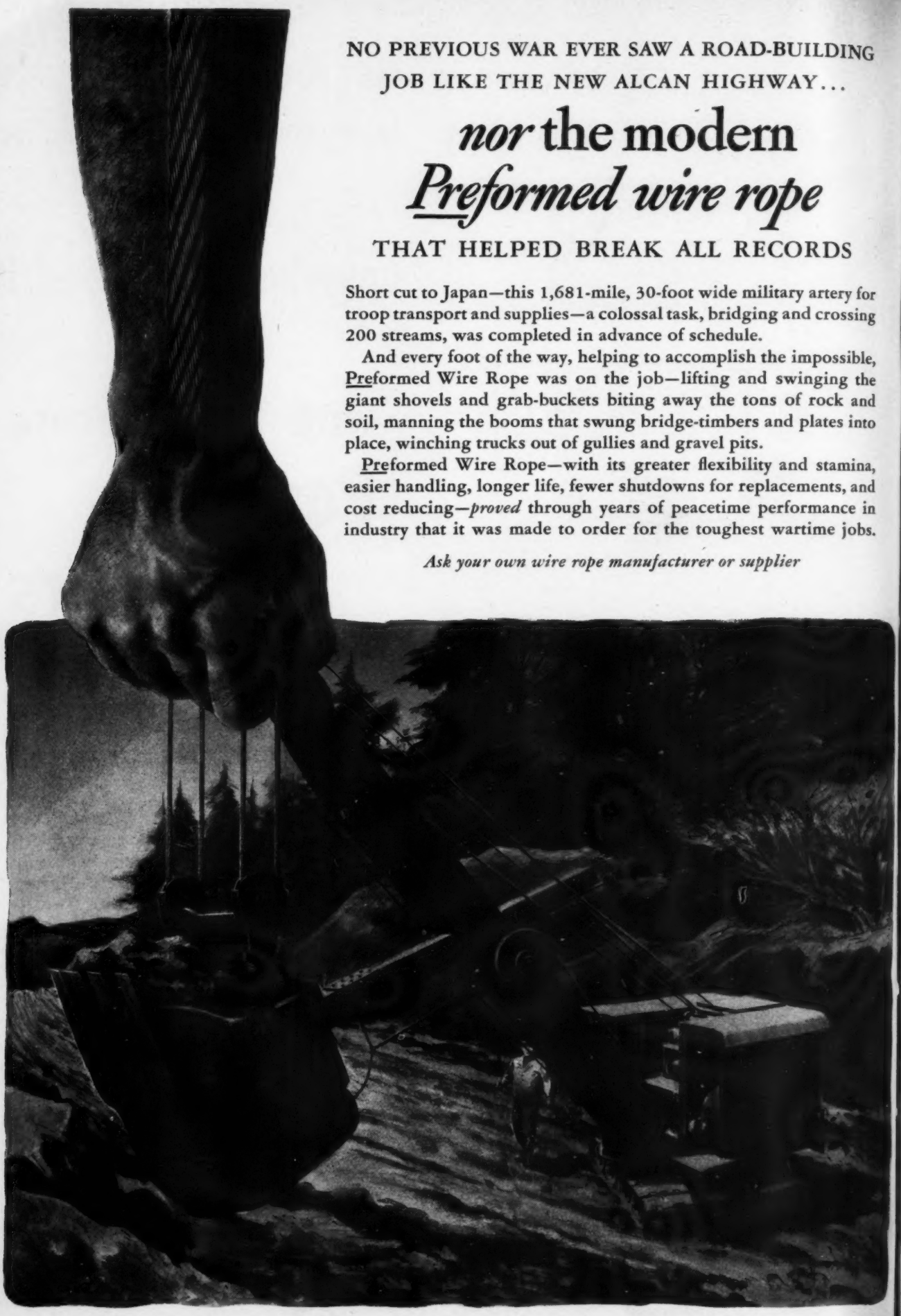
THAT HELPED BREAK ALL RECORDS

Short cut to Japan—this 1,681-mile, 30-foot wide military artery for troop transport and supplies—a colossal task, bridging and crossing 200 streams, was completed in advance of schedule.

And every foot of the way, helping to accomplish the impossible, Preformed Wire Rope was on the job—lifting and swinging the giant shovels and grab-buckets biting away the tons of rock and soil, manning the booms that swung bridge-timbers and plates into place, winching trucks out of gullies and gravel pits.

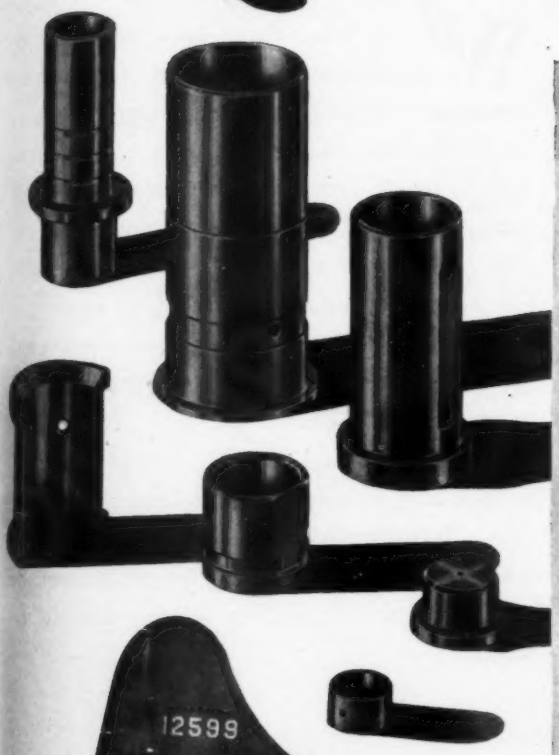
Preformed Wire Rope—with its greater flexibility and stamina, easier handling, longer life, fewer shutdowns for replacements, and cost reducing—*proved* through years of peacetime performance in industry that it was made to order for the toughest wartime jobs.

Ask your own wire rope manufacturer or supplier



AMERICA IS BUILDING 'EM

"Bigger and More Deadly"



In the nightmares of the Nazis looms a huge winged thing, the very lines of which suggest its vast and lethal power. It is the super-bomber from America, described by military experts as "bigger and more deadly" than any ever before produced.

Bunting Bronze Bearings fly with many of the big bombers. In the powerful engines of these great destroyers, in the landing gear, tail gear, and at other important points are the Precision Bunting Bronze Bearings that are making history in bearing design and manufacture. The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

Bunting

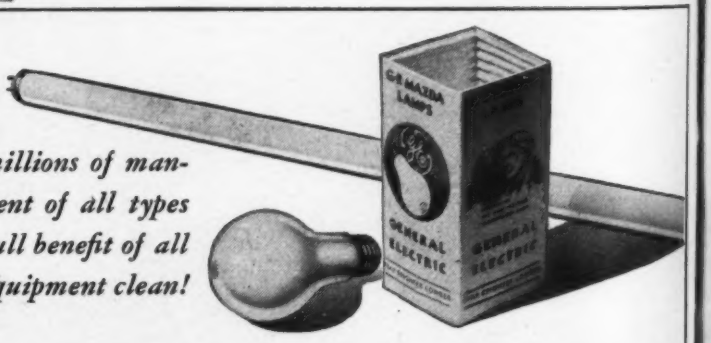
BRONZE BUSHINGS • BEARINGS • PRECISION BRONZE BARS

ARE YOU THROWING AWAY 29 YEARS OF RESEARCH?

WHEN you allow dust and dirt to accumulate on lamp bulbs and fixtures you may be throwing away as much as half the light you're paying for. That means you're losing the benefit of many years of General Electric lamp research. In the case of the 300-watt bulb, for example, you are throwing away the 40 per cent increase in efficiency effected by G-E research since the lamp was introduced in 1914.

Why deny yourself the added light G-E research has given you? Start a regular cleaning schedule today! Get all the light you pay for! Where lighting units cannot be easily removed, a safety ladder should be used.

General Electric scientists have devoted millions of man-hours of research to the steady improvement of all types and sizes of G-E MAZDA *lamps. Get the full benefit of all the years of G-E research by keeping your equipment clean!*



G-E MAZDA LAMPS

GENERAL ELECTRIC

Incredible Uncle Ishmael

...the one-man army!

UNCLE ISH is the derndest feller. He paid 4½ cents for that weapon, and he can shoot a clay pipe right out of your mouth at 100 yards. What's more, he's a one-man army. . . . Incredible? Well, here are the facts:

The famous Robbins & Lawrence and E. G. Lamson companies, ancestors of Jones & Lamson, had working for them in the 1800's two of the finest gunsmiths in the world. They were Albert Ball and Benjamin Tyler Henry, and the genius of these two men contributed much to the invention of a gun that was destined to make history.

That gun is known throughout the world today as the famous Winchester rifle — but in an earlier form, as the Ball lever-action repeater, it was known only as a headache to E. G. Lamson & Co. For there was a large order from the government for this revolutionary firearm, to replace the muzzle-loaders being used in the Civil War, but the war ended before delivery could be made.

The result: Hundreds of these repeating rifles were put up for sale at one-half cent a pound—and Uncle Ishmael got one. Nine pounds of the greatest gun in the world, for 4½ cents!

Later, when the patent for Ball's lever-action magazine was purchased and combined with improvements in rifle design made by Henry and another gunsmith named King, the great Winchester rifle was born. And it was an early advertisement for this rifle that told how Uncle Ishmael was a one-man army. "A man armed with one of these rifles," it read, "can load and discharge one shot every second, so that he is equal to a company every minute, a regiment every ten minutes, a brigade every half-hour, and a division every hour!"

The company in which that famous firearm had its origin is known today as Jones & Lamson, and the gun is typical of many great American products that have stemmed from the tools — and the men — developed by this company.

Jones & Lamson engineers and service men are at your call today . . . right now . . . to help you in solving the difficult problems of present and post-war readjustment.

JONES & LAMSON

Machine Company

SPRINGFIELD, VERMONT, U. S. A.

Profit-producing Machine Tools

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers.

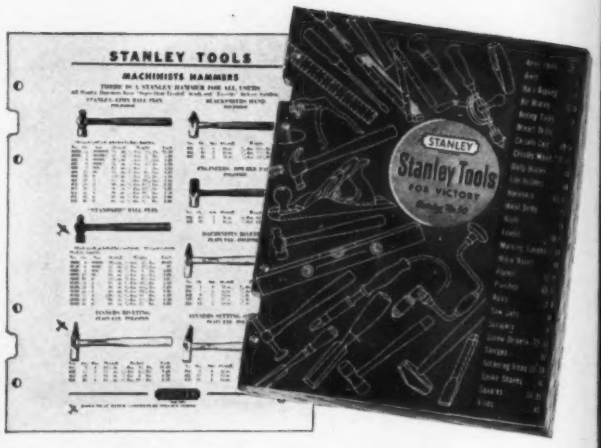
TOOLS to build Airplanes

The swarms of airplanes needed to speed the doom of the Axis could never be built nor serviced without *hand tools*—hammers, screw drivers, planes, breast drills, chisels.

Airplane manufacture is typical of current war production in which **STANLEY TOOLS** are being used in tremendous quantities.

TWO VALUABLE REFERENCE BOOKS

New Illustrated Index shows **STANLEY TOOLS** that meet Government Department Specifications. Approved tools with their specification numbers and regular Stanley Catalog numbers are included. An invaluable aid to buyers.



Stanley Industrial Tool Catalog No. 50 is especially useful reference book for tool buyers...a 56-page guide book of the world's best-known tools, fully illustrated... 17 complete lines... outside indexed for easy use. Keep a copy handy.

1843 STANLEY 1943

TRADE MARK

STANLEY TOOLS

DIVISION OF THE STANLEY WORKS
143 ELM STREET, NEW BRITAIN, CONN.
THE TOOL BOX OF THE WORLD

Official U. S. Army Photo

Here's What It Takes To Build Your Glory Road

When a Colonel of engineers said the new Alcan Highway—the "Glory Road of America"—was built by "guts and tractors" he stressed the former.

ALTER EGO: And how right he was! When tough "competition" from the west threatened to annihilate us, it jolted us into super-action. Alcan's 1800-mile route through uncharted wilderness — said to be *impassable* — was a confusion of mud, mountains and mosquitos. Under the spur of Jap "competition", we finished this "glory road" in one season.

Maybe that's a lesson for us to be on the alert for the tough competition that'll invade all business after the war. Let's jolt ourselves into super-action now.

ALTER EGO: Right! We've got to hack through plenty of uncharted wilderness that seems impassable . . . with little time on our hands . . . and come out with *better products* and *lower costs* than the other fellow. *Will-power* and *ingenuity* will build *this* "glory road".

We have the will-power. Let's acquire the ingenuity by improving our welding knowledge *with Lincoln's aid.*

Ask your inner self if welding knowledge isn't the shortcut to postwar success.

THE LINCOLN ELECTRIC COMPANY · CLEVELAND, OHIO

Sunnen Precision Honing Assures Absolute

INTERCHANGEABILITY OF PARTS!

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

● While the Sunnen Precision Honing Machine is *guaranteed* to be accurate within "one-tenth"—*production jobs have been held to .000025"!*

This amazing accuracy — together with the super-smooth finish (of 2 to 3 micro-inches) — makes possible absolute interchangeability of parts, saving production time and conserving vital war materials!

And — the Sunnen method does not require skilled labor. Girls in "teens" can be trained to handle jobs in "tenths" in a few hours.

Consider These Important Advantages

The Sunnen Precision Honing Machine handles internal cylindrical surfaces from .185" to 2.400" in diameter. No jigs or fixtures needed — work is held in the hands.

Low in cost — economical to operate! Fast! Can be "set up" for any size in its range in less than a minute!

Facilitates duplication of sizes. Relieves big internal grinders for other jobs.

Let a Sunnen engineer check *your* job in your plant with this equipment. Or write for free bulletin giving detailed information.

SUNNEN PRODUCTS COMPANY
7938 Manchester Avenue St. Louis, Missouri
Canadian Factory: Chatham, Ontario

SUNNEN

Aluminum Aircraft Link produces high finish without bell-mouthing.

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

"Strict alignment maintained between two holes."

Aircraft Valve Tappet Roller. 4-Micro finish.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

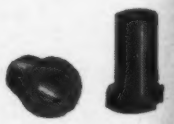
Saved time in producing a smooth, accurate finish on this bronze remote control valve body.

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

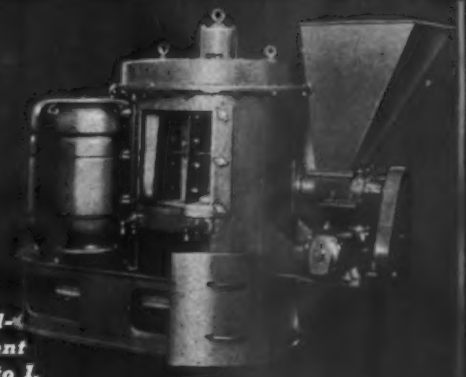
Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

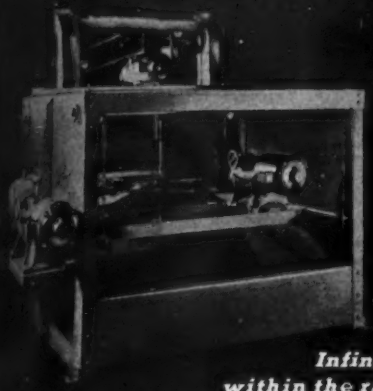
Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Hardened Steel Ring Gauge—finished to an accuracy of .000025" for roundness and straightness.



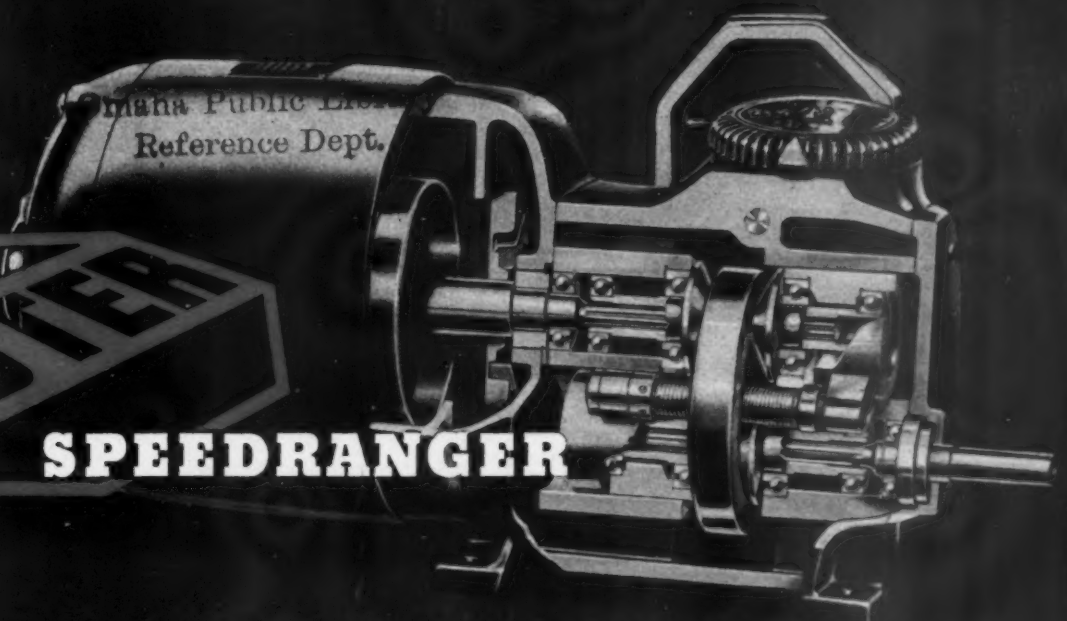
Drill Jig Bushing "Increases sales appeal of product."





Available in sizes up to and including 3 horsepower in three different speed ranges—3 to 1, 6 to 1 and 9 to 1. Only with an all-metal drive can you secure the compactness, simplicity, flexibility and economy that are so advantageous today.

Infinitely variable speed may be secured to any R.P.M. within the range of the unit. The output speed is increased or decreased by variation of the position of the ring on the two driving and two driven cones.



MASTER

SPEEDRANGER

THE MASTER ELECTRIC COMPANY • DAYTON, OHIO

Save material and save space with the simple compact, integrally built Master Speedranger. The all-metal construction insures greatest possible durability and freedom from service interruptions.

Available in the vast number of types that make up the Master line including the flanged type as shown, also gearhead, unibrake, fan-cooled, explosion-proof, splash-proof, multi-speed, etc.

FOR BAKING—DRYING DEHYDRATING OR PREHEATING OPERATIONS

Infra-red

On the war production front, today, industry has found amazing advantages in the employment of the Near Infra-red Process. Its sensationally faster speed than other forms of heat transfer — its space and material savings — its simplicity and equipment flexibility for easy adaptation to varying operations — its uniform results and lower installation and operating costs — have given new high production efficiency to hundreds of well-known industrial plants.

Wherever drying, baking, dehydrating, pre-heating and similar operations present a problem, the Near Infra-red Process warrants investigation. Its utility is widespread and its employment is increasing rapidly. Case histories of the many installations reveal the highly successful utilization for products of many varying types. Send, today, for evidence applicable to your particular operation.

CONSERVES

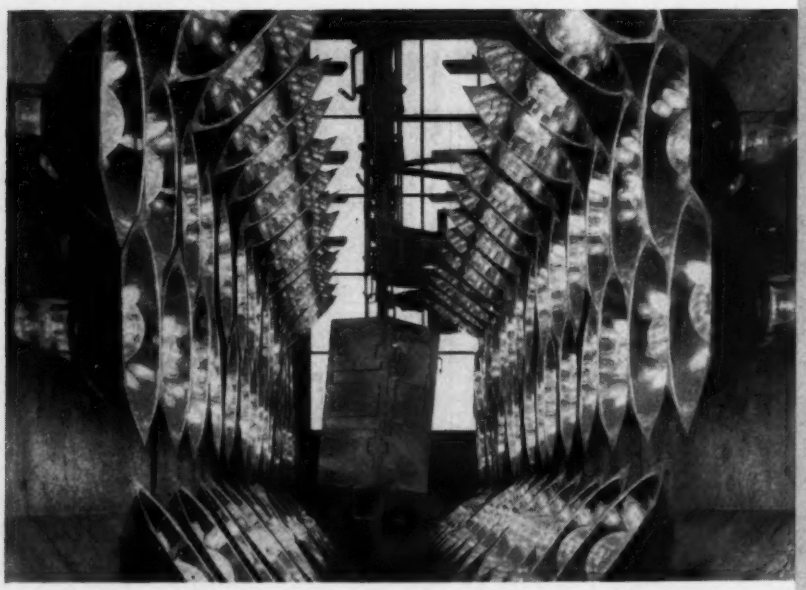
TIME
Spectacular speed on many operations cuts hours to minutes, substantially reducing production costs.

SPACE
Gives more production per square foot of floor space. Equipment may also be suspended from ceiling or wall.

ENERGY
Substantial reductions in power costs result on many installations.

MATERIAL
Provides uniform results that reduce rejects as every piece is processed under identical conditions.

MAN POWER
Simplicity of the process eliminates need for skilled operators. Output is greater per man-hour.



FOR EXAMPLE —

Pictured here is a Fostoria Infra-red tunnel installation in a (censored) war plant. Artillery shell boxes first pass through a paint spray booth and then move through the Infra-red baking zone on a conveyor.

Baking time is 6 to 7 minutes compared to the former normal air drying period of 2 to 4 hours.

From baking of paint to the drying of ink, dehydrating textiles and preheating metal fittings, Infra-red is setting a new high in production efficiency.

For Pretesting and Recommendations

CALL YOUR FOSTORIA INDUSTRIAL SERVICE CENTER

Fostoria Industrial Service Centers, located in principal cities, are properly equipped and well qualified to solve your baking, drying, dehydrating or preheating problem. If their practical tests prove the Infra-red Process to be a logical solution, the proper equipment to do the job is recommended. The service provides installation supervision and stands by to help the user obtain and maintain forecasted results. Request this service, now, without obligation.

THE FOSTORIA PRESSED STEEL CORPORATION • Fostoria, Ohio
In Canada — Write Amalgamated Electric Corp., Ltd., Toronto

INFRA-RED
Fostoria
PARA-SPHERE
FOR BAKING • DRYING
PREHEATING • DEHYDRATION

What big ears you have!

Long before the first faint hum of a plane can be heard, these giant ears have detected it and the anti-aircraft guns swing into menacing position.

Inch by inch, foot by foot, they turn, following every movement of the approaching craft; and as they turn, the synchronized guns turn, too. Woe to an enemy who chances within their range!

The delicate mechanism that points these guns owes its accuracy in no small measure to the reducers that control the micromatic movement through the arc and bring the guns to bear exactly on their objective.

And Foote Bros. speed reducers are on this job at listening posts with the Army and the Navy throughout our possessions and on our far-flung fronts doing their part in protecting our forces against air-borne aggression.

The lessons learned in the school of war are already assuring our Armed Forces of better speed reducers—sturdier and more compact speed reducers. These same lessons applied to post-war manufacturing promise a new conception of the transmission of power to American manufacturers after the war.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5301 S. Western Boulevard
CHICAGO

FOOTE BROS

Better Power Transmission Through Better Gears

Neglect is a SABOTEUR

IN THE THOUSANDS of plants which depend on Multiple V-Belt Drives to keep the flow of vital war materiel at flood tide, there may be a saboteur at work effectively slowing down production and wasting precious rubber.

This saboteur is particularly insidious—he can't be seen—nor can armed guards or wire fences keep him out. His name is NEGLECT—neglect of a few simple rules for prolonging the service life of Multiple V-Belt Drives.

You can eliminate this saboteur from your plant by applying the recommendations of the Engineering Research Bureau of the Multiple V-Belt Drive Association. You'll find them in the Association's book on Conservation—prepared and published at considerable expense for the sole purpose of aiding power users win the war on the production front.

MULTIPLE V-BELT DRIVE ASS'N
TRADE MARK

The use of this emblem by an association member in connection with Multiple V-Belt Drives is your assurance of mechanical excellence . . . the result of cooperative engineering, research and experience.

MULTIPLE V-BELT DRIVE ASSOCIATION
140 SOUTH DEARBORN ST., CHICAGO

Write for this FREE Association Book Today!

Saving Maintenance

WITH KLAMP-TITE SWITCHES

FIG. 1

FIG. 2

FIG. 3

A 10,000 ampere, low-voltage Klamp-Tite in closed position, Fig. 1; in closing position, Fig. 2; and in fully-opened position, Fig. 3.

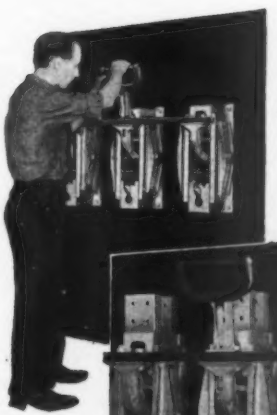


FIG. 4

FIG. 5

Klamp-Tite Switches are of many types, for service from 1600 amperes up. Figs. 4 and 5 are of 5000 and 4000 ampere capacity, respectively.

WHEN a Klamp-Tite Switch is closed, contacts bear against terminals under thousands of pounds constant pressure. The surfaces, silvered and pressed together, can remain in closed position for years without maintenance.

In Klamp-Tite design, heavy bronze bars which produce positive contact pressure are located outside the current path where they are not subject to overheating and distortion.

The elements in conventional switches which make for frequent inspection and maintenance are entirely absent in Klamp-Tites. Consequently, Klamp-Tites can be depended upon to protect critical production schedules.

I-T-E

AIR SWITCHGEAR

IMMERSED IN AIR • ENCASED IN STEEL

Representatives in Principal Cities

CIRCUIT BREAKER CO., PHILADELPHIA, PA.

Enlarged reproduction free on request

Servant of Freedom

Mighty servant of all America is the Construction Industry. Its strength is the strength of our great quarries, mines and forests. Its driving power comes from our extensive oil wells and factories . . . and from the minds of men who dream of making an ever better world.

Now during war, Construction marches only against the enemy . . . but with Victory, Construction will again bring progress in its train.

Already the Construction Industry has brought us vast networks of highways, bridges and airports —to help free men from barriers of distance, time and transportation costs . . . massive dams are making low-cost electricity available to more and more millions, lifting old burdens . . . vast aquaducts and sanitation systems are contributing to our people's health.

With the return of peace, Construction will bring in its train ever new and greater contributions toward the better life for all.

★ ★ ★

Wickwire Rope is proud of the privilege of helping the Construction Industry in its engineering accomplishments . . . in quarries, on highways, in the building of dams, bridges, and structures of all kinds.

A CHALLENGE

The present shortage of steel, and of wire rope, challenges each member of the Construction Industry to make each length of wire rope now in service last longer than ever before. Every man who uses or handles wire rope can help.

We will be glad to furnish free copies of the helpful book "Know Your Ropes," which pictures the right and wrong ways to use wire rope. TAKE UP THE CHALLENGE—WRITE FOR YOUR COPY—AND MAKE SURE ANY NEW MEN KNOW THE *RIGHT* WAYS. . . . Address Wickwire Spencer Steel Company, 500 Fifth Ave., New York, N. Y.

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WICKWIRE ROPE

Sales Offices and Warehouses: Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles, Tulsa, Chattanooga, Houston, Abilene, Texas, Seattle. Export Sales Department: New York City

WISSCO PRODUCT

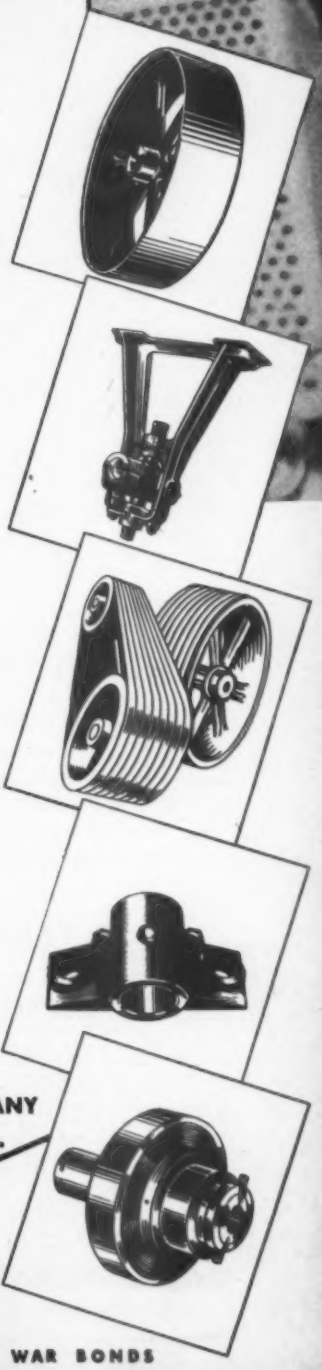
WOOD'S *Planned* POWER TRANSMISSION

KEEPS MACHINES PRODUCING AT TOP EFFICIENCY

America's great need now and for years to come, is a maintained high production rate. To achieve this, machines must operate with high efficiency and without interruption. Wood's Planned Power Transmission . . . the application of Wood's Power Transmission Equipment, to your specific requirements . . . will help you attain peak production, as it has countless other plants. Our experience, which is at your service, results from 86 years of specialization in the development, design, manufacture and application of power transmission equipment. Call on us.

EVERYTHING IN TRANSMISSION

BEARINGS • COLLARS • CLUTCHES • COUPLINGS
CONTACTORS • HANGERS • PILLOW BLOCKS
PULLEYS • V-BELT SHEAVES AND COMPLETE DRIVES



WOOD'S *Planned* POWER TRANSMISSION

Saves Power
by using fewer but larger and more efficient motors.

Cuts Initial Expense
Larger motors are less costly to install per horsepower than smaller ones.

Betters Power Factor
because of the use of larger, more fully loaded motors.

Lowers Connected Loads
through proper grouping of production machines.

Reduces Maintenance
Fewer parts to keep in order.

Steps-up Production
High, uniform speeds insure greater output, less spoilage.

Minimizes Unit Cost
Greater efficiency keeps down power required per item produced.

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CHAMBERSBURG, PA.

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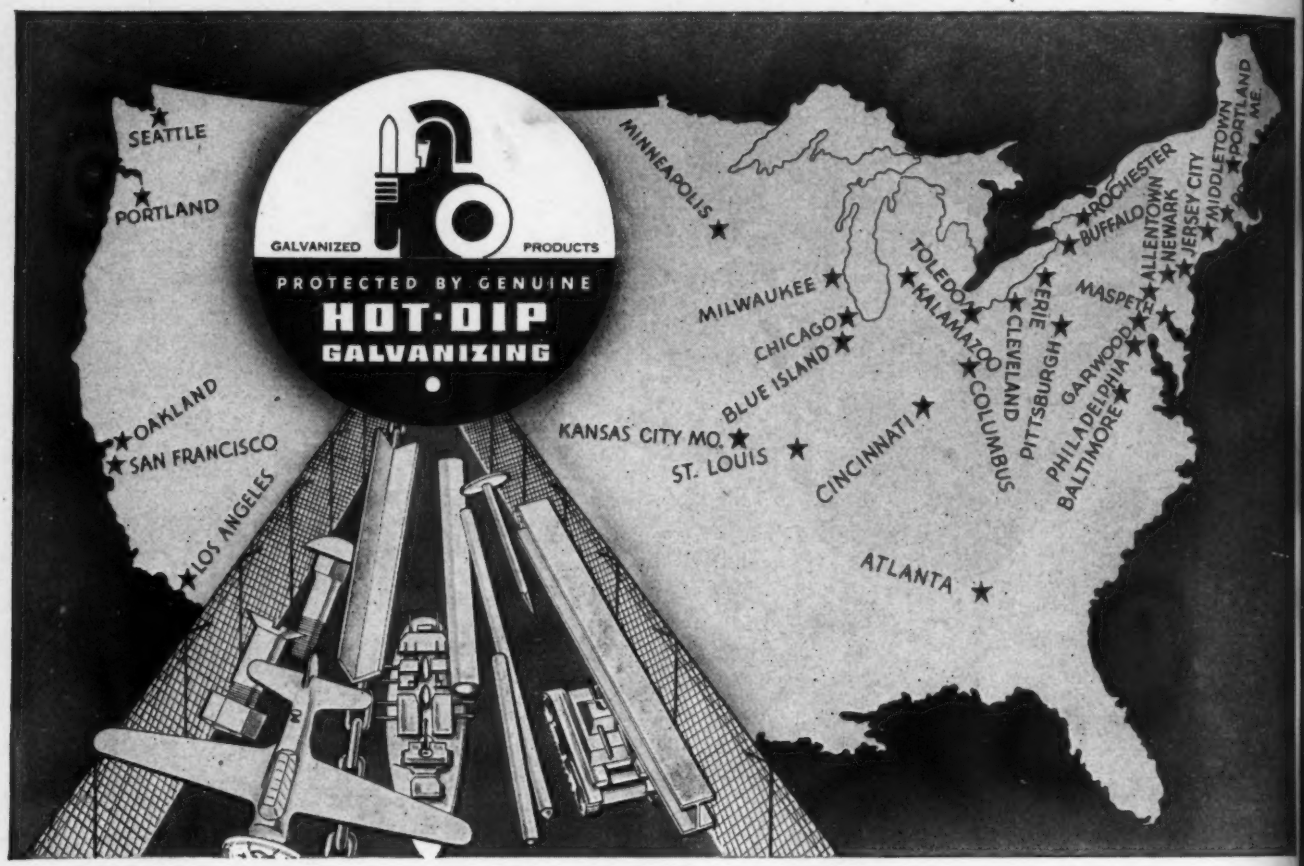
LONG LIFE LINE

BUY WAR BONDS

AMERICAN HOT DIP Galvanizers Association

STRATEGICALLY LOCATED WITH REFERENCE TO STEEL

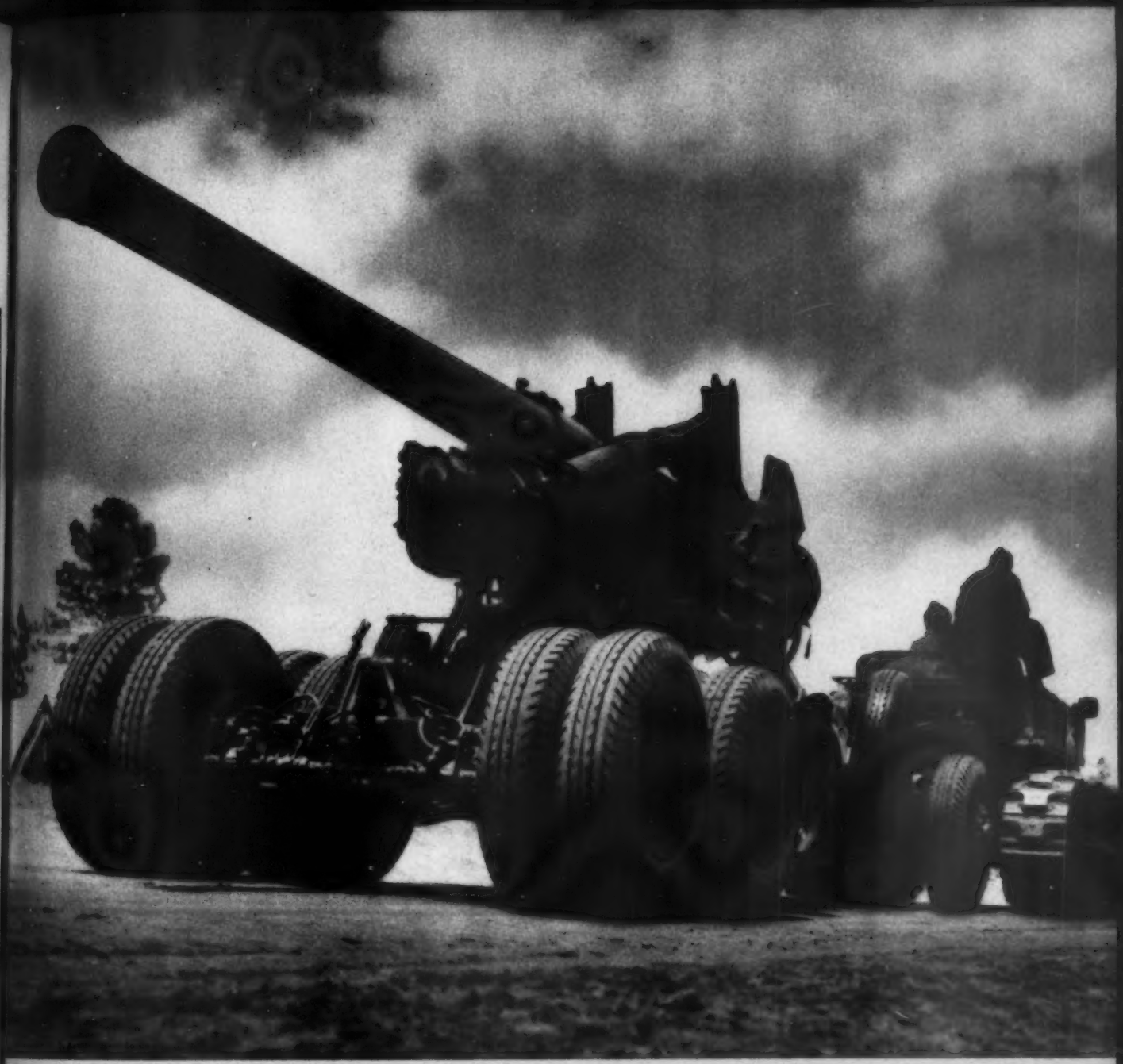


WHEREVER THERE'S A NEED . . . THERE'S A MEMBER

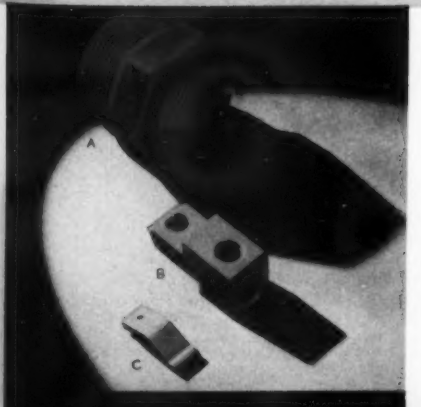
Rigidly *adhering* to the highest standards of quality at reasonable prices, *maintaining* the most modern and completely equipped shops, *employing* expertly trained personnel, *enjoying* the constant help of an efficient research department, this association represents *the* pioneering, stabilizing anchor of the galvanizing world . . . It is *your guarantee* of getting good work quickly and a genuine Hot Dip Job every time . . . Why gamble—deal with a *known* quality—send your materials to any one of our very conveniently located members. WE ARE ORGANIZED FOR HIGH SPEED, EFFICIENT PRODUCTION. American Hot Dip Galvanizers Association, Inc., First National Bank Bldg., Pittsburgh, Pennsylvania.

IF IT CARRIES THIS SEAL IT'S A JOB WELL DONE

Acme Galvanizing, Inc., Milwaukee, Wis. ★ Acme Steel & Malleable Iron Works, Buffalo, N.Y. ★ American Tinning & Galvanizing Co., Erie, Pa. ★ Atlantic Stamping Co., Rochester, N.Y. ★ Atlantic Steel Co., Atlanta, Ga. ★ Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N.Y. ★ Columbian Steel Tank Co., Kansas City, Mo. ★ Commercial Metals Treating, Inc., Toledo, Ohio ★ Diamond Expansion Bolt Co., Inc., Garwood, N.J. ★ Emsco Derrick & Equipment Co., Los Angeles, Cal. ★ Equipment Steel Products Division of Union Asbestos and Rubber Co., Blue Island, Ill. ★ The Fanner Mfg. Co., Cleveland, O. ★ John Finn Metal Works, San Francisco, Cal. ★ Galvanizers, Portland, Oregon ★ Thomas Gregory Galvanizing Works, Maspeth, N. Y. ★ Hanlon-Gregory Galvanizing Co., Pittsburgh, Pa. ★ James Hill Mfg. Co., Providence, R.I. ★ Hubbard & Co., Oakland, Cal. ★ Independent Galvanizing Company, Newark, N.J. ★ International-Stacey Corp., Columbus, O. ★ Isaacson Iron Works, Seattle, Wash. ★ Joslyn Co. of California, Los Angeles, Cal. ★ Joslyn Mfg. & Supply Co., Chicago, Ill. ★ L. O. Koven & Brother, Inc., Jersey City, N. J. ★ The Thomas Laughlin Co., Portland, Maine ★ Lehigh Structural Steel Co., Allentown, Pa. ★ Lewis Bolt & Nut Co., Minneapolis, Minn. ★ Los Angeles Galvanizing Co., Huntington Park, Cal. ★ Missouri Rolling Mill Corp., St. Louis, Mo. ★ The National Telephone Supply Co., Cleveland, O. ★ Oliver Iron & Steel Corporation, Pittsburgh, Pa. ★ Penn Galvanizing Co., Philadelphia, Pa. ★ Riverside Foundry & Galvanizing Co., Kalamazoo, Mich. ★ San Francisco Galvanizing Works, San Francisco, Cal. ★ The Sanitary Tinning Co., Cleveland, O. ★ Southern Galvanizing Company, Baltimore, Md. ★ Standard Galvanizing Co., Chicago, Ill. ★ Wilcox, Crittenden & Company, Inc., Middletown, Conn. ★ The Witt Cornice Company, Cincinnati, Ohio



Just Born—But How It Can Talk!



A. Sawed, milled, drilled and threaded packing gland. **B.** Sawed, drilled, milled and tapped fairlead. **C.** Molded, milled and drilled arm contact.

THE 155 mm. gun, biggest weapon of the motorized divisions, uses parts of Synthane Bakelite-laminated.

The properties of Synthane essential for the war-making are the same as those that helped produce better products during peacetime . . . excellent electrical insulating characteristics, structural strength, light weight (half the weight of aluminum), resistance to corrosion from acids, salts, water and solvents, and ease of machining.

When peace returns you will be better prepared if you will think and plan with industrial plastics such as Synthane now.

Synthane contributes to your study of plastics . . . data such as you will find on the back of this sheet.

10% for War Bonds—Treasury Department Honor Roll

Plan your present and future with Synthane Technical Plastics

SYNTHANE CORPORATION, OAKS, PENNSYLVANIA

SHEETS • RODS • TUBES • FABRICATED PARTS

SYNTHANE
Bakelite— laminated

SILENT STABILIZED GEAR MATERIAL

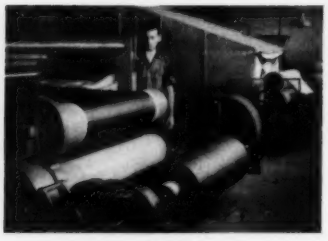
HOW SYNTHANE SHEETS, RODS AND TUBES ARE MADE

SYNTHANE Bakelite-laminated consists of a series of laminations of paper, fabric, or asbestos. Each lamination is impregnated with one or more coats of a Bakelite resin varnish before processing into sheets, rods and tubes.

Bakelite resin is a chemical compound of phenol and formaldehyde. When the two are heated together at a suitable temperature and in the presence of a catalyst to speed up the reaction, a clear amber solid resin is formed. In this stage, the resin can be melted and is soluble in alcohol or acetone.

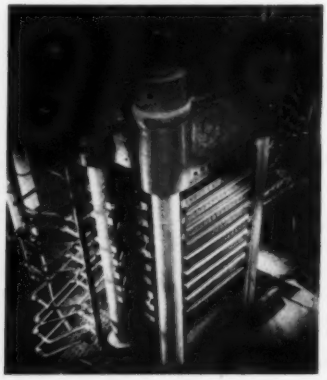
SHEETS

For the manufacture of SYNTHANE the solid resin is dissolved in alcohol to produce a varnish. The fabric or paper is impregnated by passing it over rolls which dip into the varnish. The depth of the coating is controlled by varying the specific gravity of the varnish, or by dipping more than once.



A drying oven, through which the coated sheet passes, evaporates the solvent.

After drying, the roll is cut into convenient lengths to fit the presses. A number of sheets, depending upon the thickness of the finished sheet desired, is piled up in the press. Heat and pressure are applied for a length of time sufficient to complete the chemical

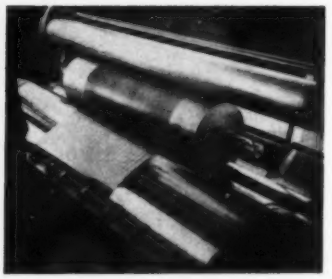


reaction and transform the resin-impregnated layers into a hard and dense solid which will not delaminate, cannot be softened by the re-application of heat, is non-hygroscopic, and possesses excellent mechanical and electrical properties. In the curing process the Bakelite resin or varnish completely polymerizes.

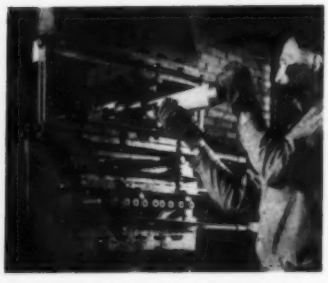
The characteristics of the finished sheet are determined by the grade of resin, type of filler used and time of cure. Those factors are dictated by the job.

TUBES

In the manufacture of SYNTHANE tubes, the bakelized paper or fabric is wound upon a mandrel under heat and very moderate pressure. This operation softens the resin and causes the laminations to stick together. Tubes are usually wound to a slightly greater diameter than called for, in order to provide a margin for grinding to size. In the manufacture of wrapped or rolled tubes, the wound tubes—as they come from the tube winding machine—are oven cured for several hours to complete the cure and form a hard dense wall which will not delaminate nor re-soften with heat.



In making molded tubes, the wound tubes—as they come from the tube winding machine—are placed in a mold, the diameter of which corresponds to the desired outside diameter of the molded tube. Tubes are wound to a diameter somewhat in excess of that corresponding to the mold diameter. The excess material squeezes out of the mold under heat and pressure. The mandrel is, of course, left in during the molding operation just as the mandrel of the wrapped tube is left in during the oven cure.



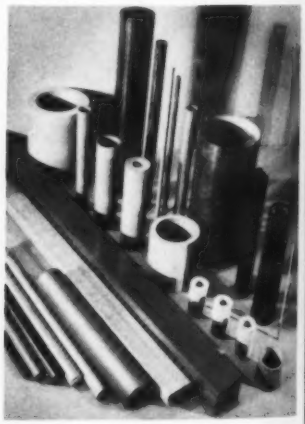
The final operation on wrapped or molded tubes after the mandrel has been removed is grinding. The tube is passed through the grinder several times, the final cut bringing it down to

size. The tubes are sanded and polished if necessary or finished with any one of a variety of lacquers according to the specifications of the job.

Square or rectangular tubing may be supplied in almost any dimension in the rolled tubing.

RODS

SYNTHANE laminated rods can be made either by lathe-turning sheet stock or by tube molding methods. In the latter case, the impregnated paper or fabric is wound up on a very small mandrel to a slightly larger diameter than that of the mold. The mandrel is withdrawn, the rod is placed in the mold and subjected to heat and pressure. Excess material is squeezed out at the mold-joint during pressing.



SPECIAL SHAPES

Special shapes may be made by constructing a mold and building it up with the required paper or fabric pieces. Molded-laminated shapes possess strength exceeding that of ordinary powder-molded pieces.

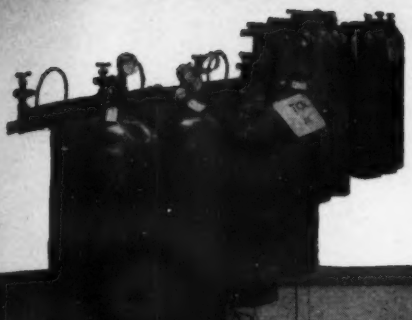
PLAN YOUR PRESENT AND FUTURE WITH SYNTHANE TECHNICAL PLASTICS

SYNTHANE
Bakelite— laminated

SHEETS • RODS • TUBES • FABRICATED PARTS • SILENT STABILIZED GEAR MATERIAL

SYNTHANE CORPORATION, OAKS, PENNA.

REPRESENTATIVES IN ALL PRINCIPAL CITIES



Manifolding

INCREASES PRODUCTIVE TIME...

...in oxyacetylene welding and cutting

Operators spend more time actually welding or cutting when working from an Airco manifold system. Since a constant supply of gas is provided at all times, welders need never interrupt their work to change cylinders, disconnect and connect regulators and perform other non-productive jobs, otherwise necessary when "setting up" for welding or cutting.

Manifolding also ensures most economical gas consumption especially on flame cutting operations, since the maximum line pressure set at the manifold valve cannot be exceeded.

Plants equipped with Airco manifold systems benefit in many other ways. Fewer cylinders are required, and inventories can be more closely controlled. Grouping cylinders in convenient locations permits easier handling and replacement of cylinders, and makes possible better utilization of floor space. Moreover, isolation of gas cylinders away from the work eliminates a possible hazard.

Air Reduction has prepared a booklet describing the installation and operation of manifolds, acetylene generators, and piping systems. This booklet, "Planning your Oxyacetylene Installation", also contains suggested plans for complete plant piping layouts. For a free copy, write to your nearest Airco office or to Air Reduction, New York.

Compare this shop arrangement with the modern layout above. A manifold system saves working space and keeps cylinders away from the work bench.

"Planning Your Oxyacetylene Installation," prepared by Air Reduction's Applied Engineering Department. Available free on request.

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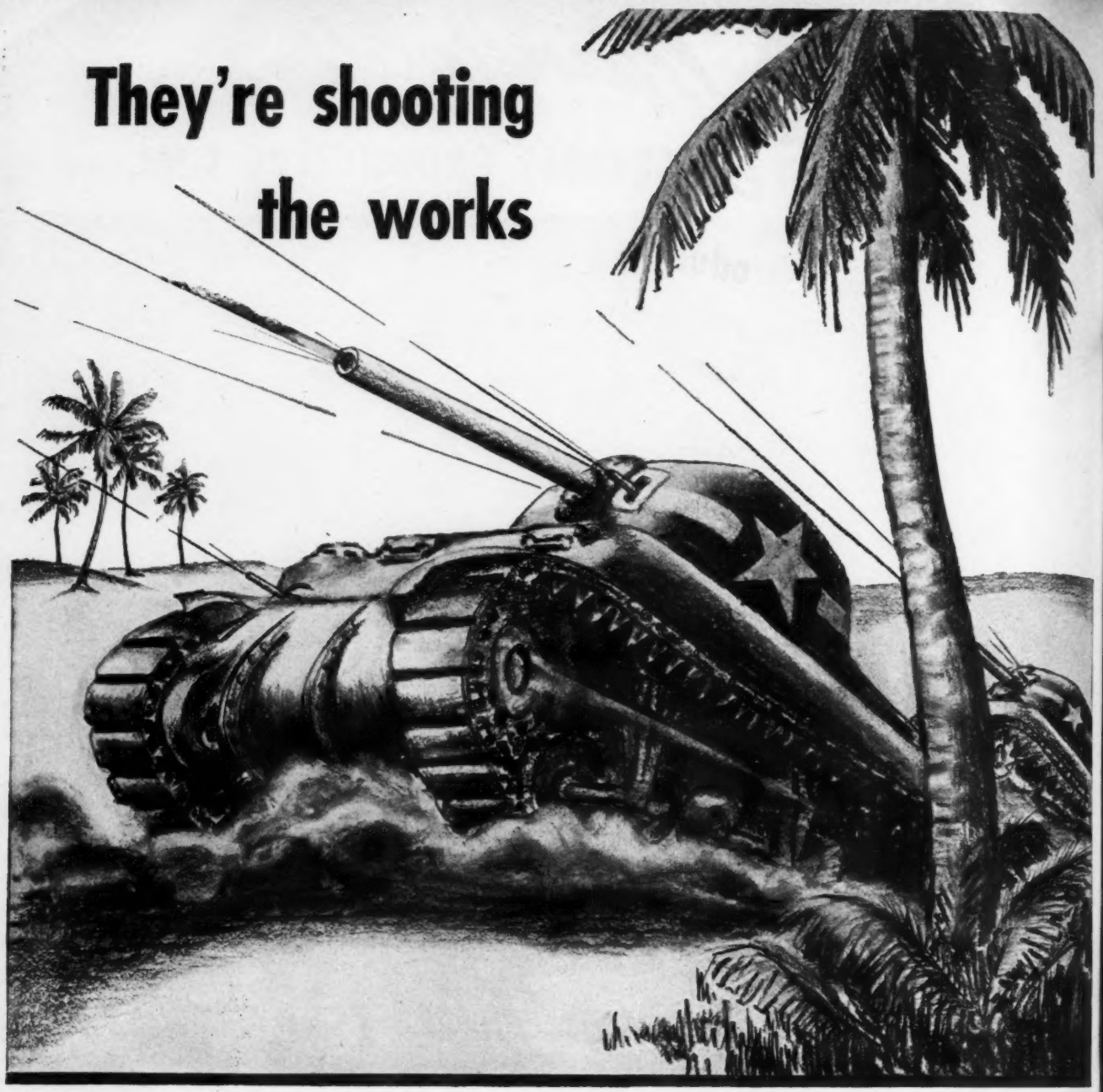
AIRCO WILSON

IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

They're shooting the works



and they're relying on us!

The men in our armed forces are giving everything they've got to this fight for freedom—and they're depending on us back home to supply the tools of war.

One way to help maintain war production at full capacity is to use *quality* packings, gaskets and oil seals—and use the proper material for each requirement. A GARLOCK representative will be glad to advise you. Call him in!

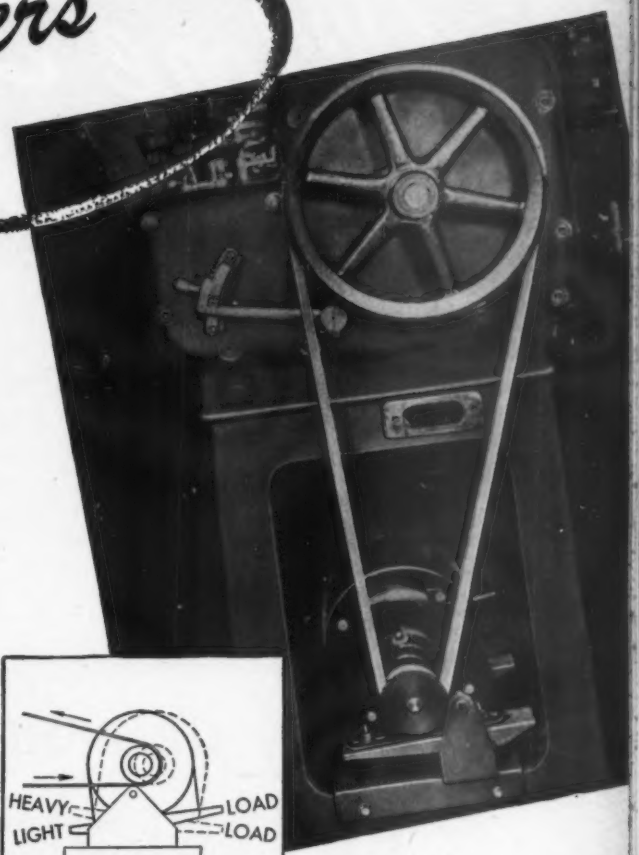
Garlock

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Manufacturers of GARLOCK Packings, Gaskets and KLOZURE Oil Seals

In Canada: The Garlock Packing Company of Canada Limited, Montreal, Que.

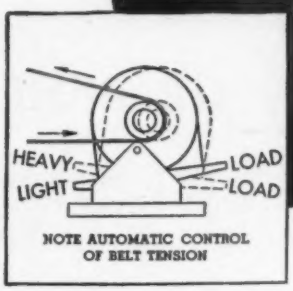
How one manufacturer eliminated "Belt-Eaters" and stepped up production 15%



In operating 50 candy cutting and wrapping machines, a well-known candy manufacturer faced several production and maintenance problems. Each of his machines had to be stopped ten times a day to be reloaded with wrapping paper. Since the starting load was 75% over normal load, belts and bearings wore out rapidly due to the high tension made necessary by the overload. Now he reports that by equipping all fifty machines with American Econ-o-matic Wedgbelt Drives, the trouble is eliminated. Belts take high starting load readily without slip. Belt take-ups have been entirely eliminated. Belt and bearing life increased. Production stepped up 15%. And maintenance costs are substantially cut.

Whether starting loads are light or heavy, improper belt tension results in many costly production and maintenance problems. When belts are too loose, you are losing R.P.M. and cutting down on the productive output of your machines. When tension is too tight, belts and bearings burn up, forcing shutdowns and interrupting production.

By changing over to an American Econ-o-matic Drive, you overcome these problems. You boost your machine output. You greatly increase belt and bearing life. The Econ-o-matic Drive is an American Short-Center Drive —either Flat-belt or V-belt—with an Econ-o-matic Motor Base that gives you *automatic* belt tension control. No more worry about belts too tight or too loose—no lost R.P.M.—no slippage—no unnecessary "time-outs" to make frequent manual adjustments—after you install American Econ-o-matic Drives.



NOTE AUTOMATIC CONTROL OF BELT TENSION

AMERICAN Econ-o-matic DRIVE

The load governs the belt tension. Here is the heart of the Econ-o-matic Drive . . . the American Econ-o-matic Motor Base. It *automatically* and *instantly* matches belt tension to each variation in the load on the motor. When the load is heavy, motor base pulls and tightens the belt. When the load is light, motor base slackens and loosens the belt. No slide rails or idlers to adjust. It's *automatic!*

Check these advantages of the AMERICAN Econ-o-matic DRIVE (Short-center Flat- or V-Belt Type)

- ★ *Longer life for belts and bearings*
- ★ *No belt slip—no lost R.P.M.*
- ★ *Maintenance man-hours greatly reduced*
- ★ *Smooth, cushioned starting*
- ★ *Increased machine output*
- ★ *Substantial power savings*

Navy "E" for excellence awarded February 12, 1942

Get This New Econ-o-matic Catalog

36 pages of helpful information that shows you how to solve drive maintenance problems—how this drive can help you increase machine output. This catalog provides you with complete information on American Econ-o-matic Drives, and shows how to select the right drive for your purpose. Send for your copy. Write now.

The American Pulley Company
PHILADELPHIA, PENNSYLVANIA

More Speed for AIRCRAFT RIVETING

NEW AIR POWERED

RIVITOR

HANDLES FLUSH RIVETING

To "keep 'em riveting" with *increased speed*... install the new T-J Air Powered RIVITOR! Combines "air squeeze" action with automatic feed riveting to meet today's aircraft production needs.

Does a speedy, efficient job of flush riveting ...averaging 1600 riveted joints per hour with no manual rivet handling. By using a different type of rivet set and jaw construction, can be adapted for handling Counter Sunk Head, Flat Head, Round Head, Full and Semi-Brazier Head Rivets. Write for latest bulletin.
The Tomkins-Johnson Co., Jackson, Michigan.

This Rivitor also available in "Twin" types for setting two rivets at the same time.

FOR TOUGH JOBS...SPECIFY T-J

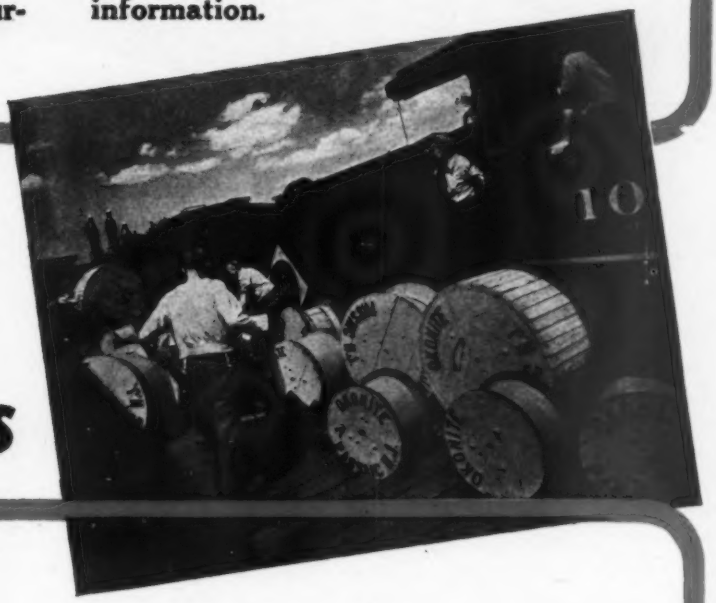
TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

DO:

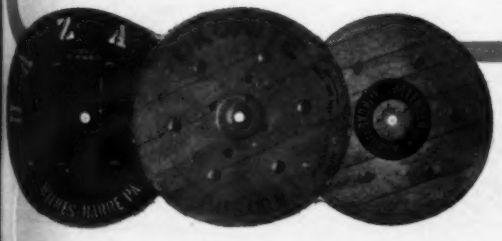
- order your wire requirements as far in advance as possible, to allow time to apply for material allocations from the War Production Board. Consult with government engineers to check with their requirements before purchasing cable for a *governmental financed project.*
- avoid complicated splices and fittings. Your Okonite representative can tell you how to simplify installations.
- supply us with cutting lengths promptly as we cannot start manufacture, in most cases, until we have this information.

To Expedite Shipment of Wires and Cables



DON'T:

- specify cables that are unnecessarily complicated. Each operation on a cable requires special machines, any one of which may be cause of delay. Keep your cable design simple. Consult your Okonite representative as to how you can do this.
- order short lengths of many sizes. Standardization on a few sizes almost always results in lower cost per foot and much quicker delivery.
- send your order in without specifying End Use, conditions of installation, preference rating, priority authorization, army, navy or other governmental contract number, if any. This information is necessary in order to secure permission to manufacture.



3190

THE OKONITE COMPANY
THE OKONITE-CALLENDER CABLE CO., Incorporated
HAZARD INSULATED WIRE WORKS DIVISION
Executive offices, Passaic, N. J. • Branch offices in principal cities
Salvage Your Scrap — Buy U. S. War Bonds

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AIR CLEANING *By Electricity*

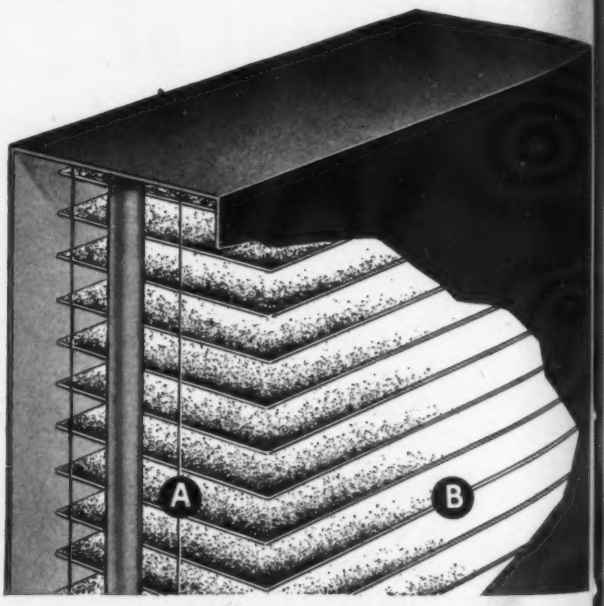
gets more than 90% of ALL particles down to 1/250,000 of an inch

There is no mystery about PRECIPITRON*—the new Westinghouse air cleaner that operates by electricity. Yet it whisks smoke, haze and dirt out of the circulating air as if by magic. Even tobacco smoke, smallest of air-borne particles, is quickly "grounded" by the Precipitron.

Electronics is the secret of Precipitron's exceptional efficiency. Sealed within the ventilating duct so that all air must pass through it, the Precipitron operates silently, effectively, with no more moving parts than a storage battery. At the front of the unit (or cell), two fine tungsten wires and three grounded rods create a strong electrostatic field. As each particle of dust or smoke passes through this field, it receives a positive charge of electricity.

A series of collector plates are located back of the electrostatic field and as the charged particles pass into this area, they are drawn to the oppositely charged plates where they are deposited and adhere. These plates are then cleaned with water and the deposit flushed harmlessly down the drain.

Precipitron's efficiency, far above that of ordinary mechanical air filters, has given a new meaning to industrial air cleaning. For full information write Westinghouse Electric & Mfg. Company, Edgewater Park, Cleveland, Ohio. Ask for folder B-3083.



A. Electrostatic field at the front of the *Precipitron*. Here all dirt and dust particles are given a positive charge of electricity.

B. Series of collector plates, to which charged dirt particles are attracted and adhere.

*Trade-mark registered in U. S. A.

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OFFICES EVERYWHERE

Westinghouse Precipitron

Electronics at Work

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Two million atoms could lie in a line across the dot of an i — yet each alone is a complete solar system, with electrons whirling around a central nucleus like planets around the sun. And that nucleus occupies no more space in its lonely atomic universe than a fly in a cathedral.

This is the physicist's picture of the atom, source of all energy. And today, with giant cyclotrons, he is smashing the atom — hurling these tiny planetary systems at each other with the speed of shooting stars, and with miraculous results: Sodium transformed into magnesium, aluminum into phosphorus — and the atom itself into power beyond the wildest dreams of Watt or Diesel or Edison. . . . In an ordinary glass of water is the potential power of a billion kilowatt hours!

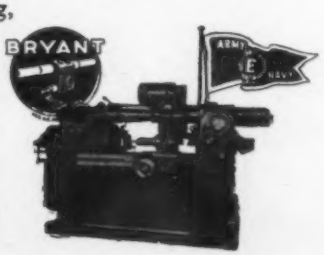
When will industry be able to harness atomic power? Possibly in six months, six years, or not for six decades, but of this you can be certain: One day, just as sure as the earth revolves about the sun, every form of power machinery in use today will be totally obsolete.

This story of atomic power is only an extreme illustration of the problems that industry faces as a result of *change*.

Today, we are living in the midst of far greater and swifter change than the average business is prepared for. As a result, many businesses — seemingly on the rise — are actually on the brink of failure in the new world of post-war production.

If your business is manufacturing with metal . . . and if you are planning ahead now . . . there is one thing that you can do to protect your business against failure to keep pace with changing methods of production: Consult with the leading *specialists* in machine tool engineering!

In the vast and highly specialized field of internal grinding, there is Bryant! Call upon us now!



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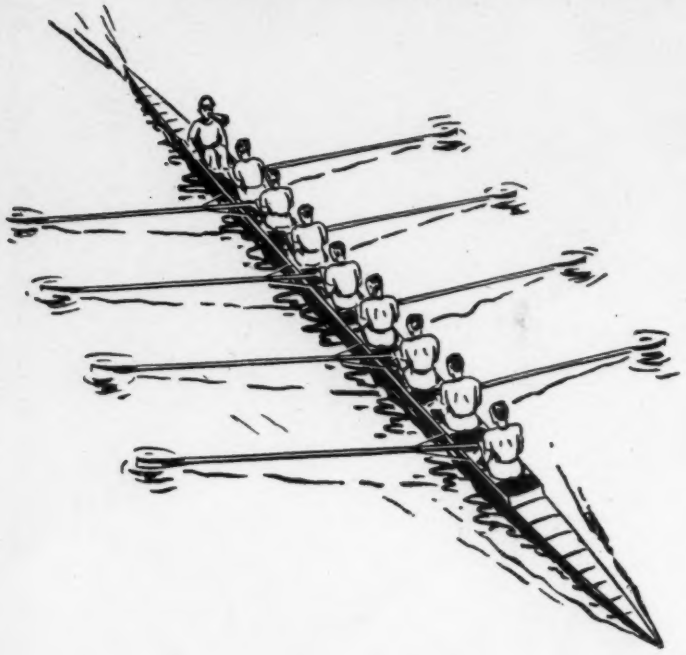

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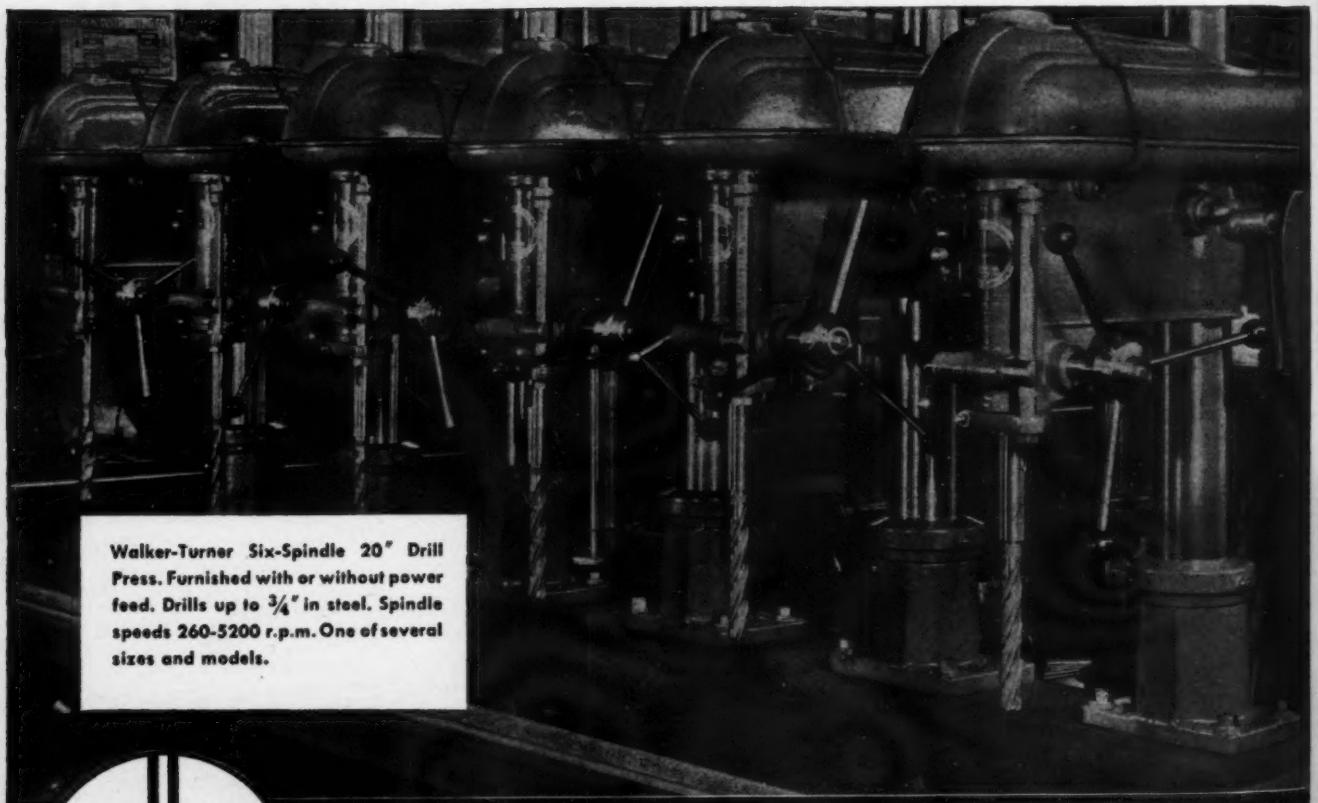

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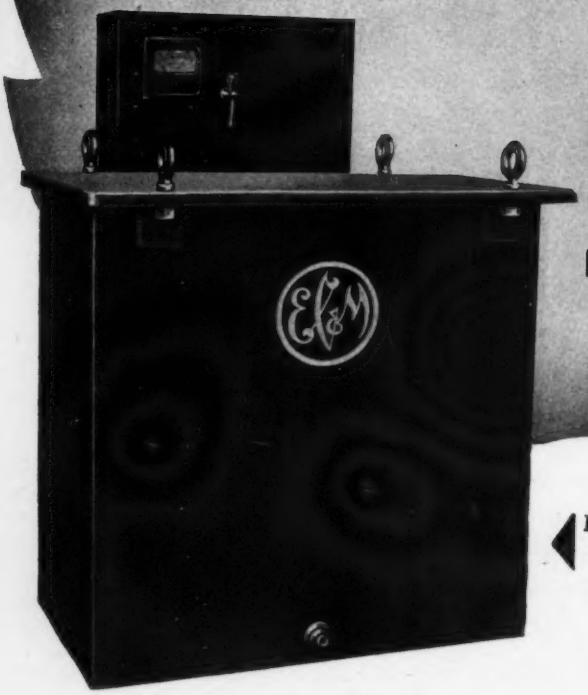
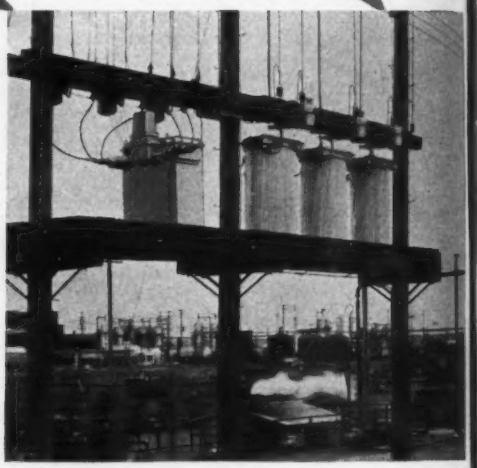
EC&M COMPLETELY ENCLOSED *Unit Starter* FOR 2300-VOLT MOTORS



Push button operated from low voltage



For outdoor mounting and indoor operation

THIS highly efficient starter for squirrel-cage or synchronous motors offers five definite advantages:

1—Single, quick-break, double-throw Contactor operated by a single magnet, a throw-over spring and a mechanical latch tripped by a Current Limit Relay to cause transition from reduced voltage to full voltage running.

2—Continuous Torque during transition from reduced to full voltage.

3—Self-contained Potential Transformer for 220-volt push button circuit with enclosed fuses also in this circuit.

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5—NEMA Type II (Drip-tight) Enclosure for floor mounting with compensator-mechanism completely oil-immersed.

Arranged for Low Voltage Protection or Low Voltage Release as specified. Ask for Bulletin 1047-C.

THE ELECTRIC CONTROLLER & MFG. CO.
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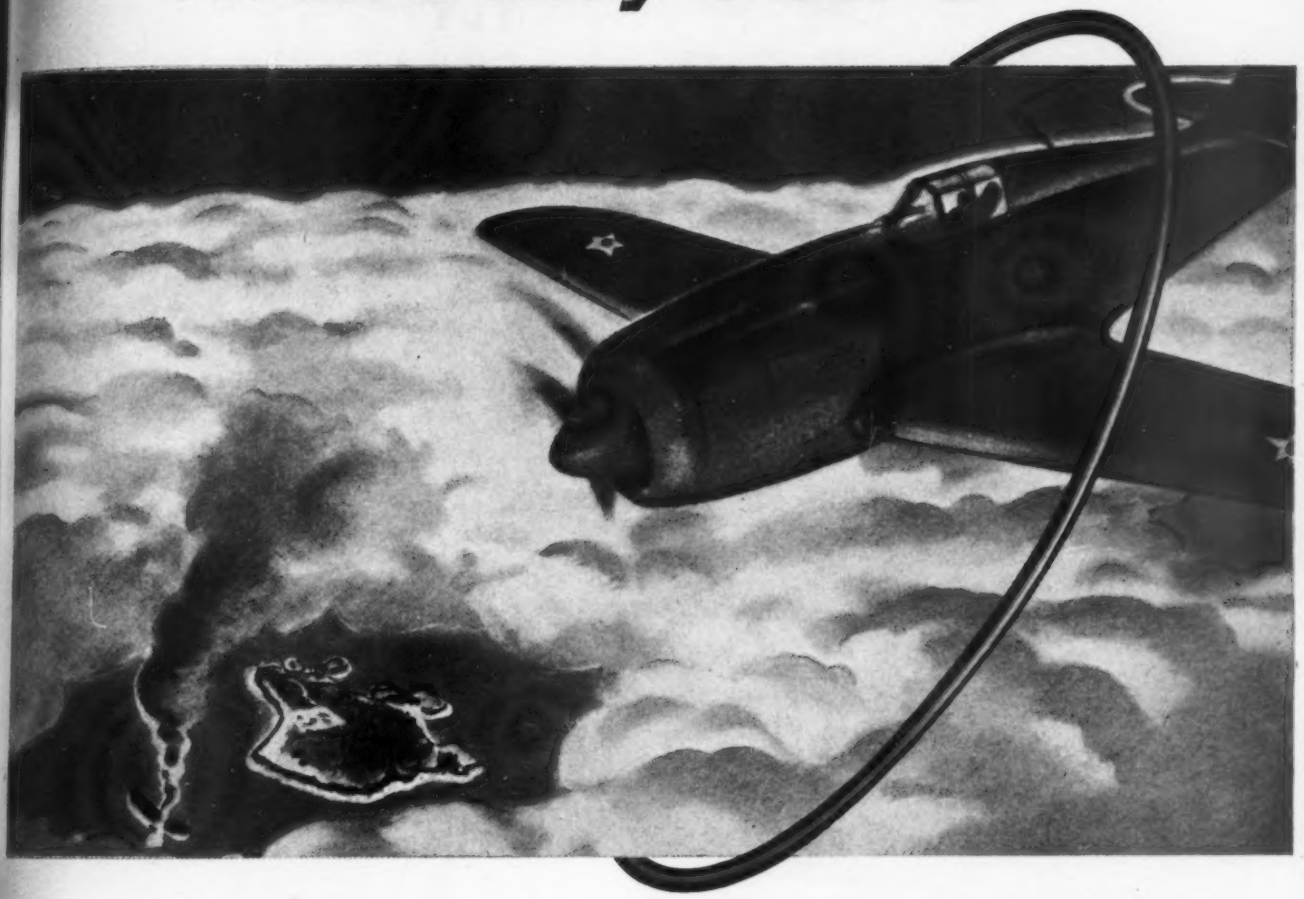
Fail? – They can't fail ... and they DON'T



THIS little synthetic rubber ring had a lot to do with that dead Zero up there. And with a lot of other dead Zeros, too.

It's an Oil Seal Ring, made by Acushnet, (we're proud to say) from synthetic rubber compounds for Pratt & Whitney and Pratt & Whitney licensees. On it depends the perfect functioning of an airplane motor. On it may depend victory or defeat, life or death. It *can't* fail . . . and our job is to see that it *doesn't.*

This ring has to stand hot oil at 300° F. for 168 hours! It has to swell between 15% and 40% after its oil-bath. It has to flex 180° without showing a surface crack.

Such tests are not easy to meet — particularly when new processes and new substances are involved in the manufacture of the product. That we have been able to meet them in a satisfactory manner is the basis for our pledge to strive for perfection in the production of all molded rubber goods bearing the Acushnet name.

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Under today's terrific pressure men with perfect vision work fast and accurately only with adequate illumination. But remember...a high percentage of industry's workers do *not* have perfect vision! They can do all expected of them...*all they want to do*...without accidents or slowdowns, only if you help them see clearly and sharply at all times.

MILLER 50 FOOT CANDLER or 100 FOOT CANDLER, the *original* continuous wireway fluorescent lighting systems, can provide your war-manpower with adequate, man-made *daylight* for better, faster, safer production. Or, MILLER can provide modern incandescent or mercury lighting, depending on your plant's set-up and particular problems.

Because of this the MILLER field engineer is in an unbiased position to work with you right now . . . to cooperate intelligently in the fine work you are now doing to help speed Victory.

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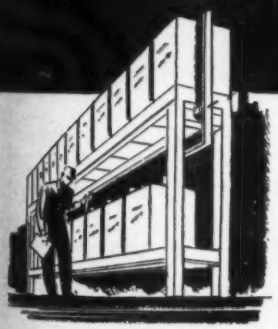
VITRABLOC STORAGE BATTERY



Philco Floté in Vitrabloc is the most attractive industrial storage battery ever made. Pure white, highly glazed, Vitrabloc brightens dark battery rooms.

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Even in peacetime, Philco Vitrabloc would be a tremendous advance in storage battery construction. Today, when batteries must do a bigger job . . . when critical materials are a problem—Vitrabloc is a truly sensational development!

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Best of all, no critical materials are used in this vitrified ceramic jar! You can get Philco Vitrabloc batteries on exceptionally low priority!

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GREATER RESULTS on the home front, too!

Official U. S. Navy Photo

MORE AND MORE ships like the above hurling depth charges to destroy enemy submarines are necessary to protect cargo vessels carrying the ever-increasing volume of output from the mines, farms and factories of America if our armed forces are to be supplied with the many things needed for achieving victory.

The necessity for maximum production is putting a terrific strain on equipment... thereby making effective lubrication more vital than ever.

So effective have Texaco Lubricants proved in increasing output that they are definitely preferred in many important fields, a few of which are listed in the panel.

A Texaco Lubrication Engineer will gladly cooperate with your operating personnel to increase the output in *your* plant. Just phone the nearest of more than 2300 distributing points in the 48 States, or write to:

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★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

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TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

Textiles—in War as in Peace

World's oldest industry performs modern miracles

WITH ever quickening tempo the friendly hum of the spinning wheel has echoed down the centuries—symbol of a mighty industry.

Its hum is heard today above the din of war.

Capt. Rickenbacker heard it as the lives of his party depended upon a thickness of rubberized fabric.

The hard-pressed soldier on a far-off Pacific isle hears it when he sees fresh supplies and ammunition descending from the sky via friendly parachute.

Adolf Schickelgruber hears it when winter joins forces with the enemies of his ill-clad armies and hastens the day of his defeat.

Yes, man is dependent upon textiles from the cradle to the grave – in peace and in war.

In peace man demands comfort and beauty. In war he must have comfort and protection. The textile industry is coming up to these expectations.

It is developing hundreds of special fabrics for special purposes. It has created clothing for wear, miles high in the stratosphere, and fathoms deep under the sea, clothing to meet the daytime heat of the desert and the bitter cold of its nights, clothing for the tropics and the Arctic, the swamps and mountains – for every climate and every condition.

Modern scientific warfare has forced the development of textiles that were not even thought of a year or two ago: camouflage nets; strong, light, wind-resistant Nylon tentings for the Arctic; heavy Nylon rope for glider towing; parachutes and parachute shrouds; self-sealing gas tanks; panzer hangars; cartridge and powder bag cloths; helmet linings; gas masks; fuses; canvas tops; windshield fabrics and seat upholstery for jeeps, trucks and other motorized equipment; uniforms for all armed services and for nurses, WAACS, WAVES, SPARS and MCWRS. Then there are windbreakers, raincoats, ski-troop uniforms and other items two numerous to mention. The Star Spangled Banner itself is a textile.

The Quartermaster Corps alone has issued specifications for over 300 different fabrics! Add to this the requirements of the Navy, the Air Forces, the various Civilian Defenses, the Red Cross and Lend-Lease and the sum total of textiles required for military and allied uses is approximately 70% of the total produced before the war to meet civilian requirements!

How the textile industry has been able to meet this unprecedented war demand, superimposed upon the industrial and essential civilian needs, is an inspiring story.

First, it stepped up its production to an all-time high. *Textile World's* index of textile-mill activity records three successive records for 1940, 1941 and 1942, the period covering the defense program and the first year of the war. This index for 1942 stood at twice that of an assumed "normal" year. It is noteworthy that this was accomplished mainly with existing equipment.

Second, the textile industry did a job of plant-conversion which was a masterpiece of intra-industry cooperation and idea-sharing.

Third, its technicians developed new and superior fabrics and finishes. Its engineers and production men increased the speed and the efficiency of the entire production machine.

How well all this was done becomes evident when we consider the obstacles to be overcome. Imports of critical fibres have been cut off. There is a shortage of certain chemicals and dyes. There is a high rate of turn-over in manpower and a shortage in experienced labor. It is increasingly difficult to secure machines and repair-parts – just to mention a few of the major problems.

But the textile industry delivered. It has built up an adequate reserve for our rapidly expanding armed services. It is helping to supply the armies of our allies. It is providing for our civilian population . . . all without giving the war leaders a single moment of serious worry.

Major General Edmund B. Gregory, Quartermaster

This is the ninth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

General of the United States, in special statements prepared for *Textile World*, and in addresses before textile groups, has stated that the cooperation of the textile industry has been outstanding and that the industry has kept ahead of schedule on all the major types of fabrics required.

General Gregory recently pointed out that of the approximately 234,000,000 yards of combed twill produced in this country in 1942, the Army took about 87%, the Navy 10%, leaving 3% for non-military purposes.

Col. Robert T. Stevens, of the Quartermaster Corps, in a recent address, referred to the output of duck. Production of that vital military fabric was twice doubled in six months, between January and July 1942, he said, and an annual capacity of 600,000,000 yards of all types of duck was made available. "The current rate of production of cotton duck is five times normal," said Col. Stevens, "and 38% comes from converted carpet, plush and upholstery mills. Based upon known requirements, production in this field is fully adequate".

"Fully adequate" is high praise when it refers to duck production. At the outbreak of the war it looked as if there was no possible chance of meeting requirements, at least during the first year. Nor would there have been if other types of mills had not shifted to making this fabric, and if experienced duck manufacturers had not gone "all-out" in teaching the newcomers, potential post-war competitors, everything they knew about the manufacture of duck. American industry offers many such examples of unselfish cooperation.

Another outstanding accomplishment, made necessary by the interruption of burlap imports, was the conversion of looms producing peacetime fabrics to the production of bag fabrics. The tremendous demand for sandbags, camouflage cloth, food, agricultural and other bagging, caused a conversion order to be issued for the purpose of raising the annual production rate of osnaburg from 263,500,000 yards to 660,000,000 yards, and bag sheeting from a rate of 488,000,000 yards to 855,000,000 yards. The result of this order, and of the military schedules already in effect, was to put the cotton weaving industry about 88% into war, essential industrial, and essential civilian production.

Plant conversion went on with feverish speed. Carpet looms were swung to blankets and duck; the lace industry turned to mosquito netting and insect netting of which it produced millions of yards. The flat-knitting industry with its tricot machines also is engaged in the manufacture of mosquito netting. The sewing thread industry was converted to the production of combed yarns. What once was the silk industry is now doing a tremendous amount of war work. Those mills which had equipped themselves for throwing Nylon yarns for hosiery are now throwing the Nylon for parachutes. That section of the silk industry that was equipped for weaving rayon fabrics is producing fabrics of high-tenacity rayon for flare chutes, cargo chutes and delivery chutes. Many silk and rayon looms that formerly wove clothing materials are now weaving parachute fabrics.

Today practically all Nylon is used for military purposes and the bulk of high-tenacity rayon goes into military fabrics.

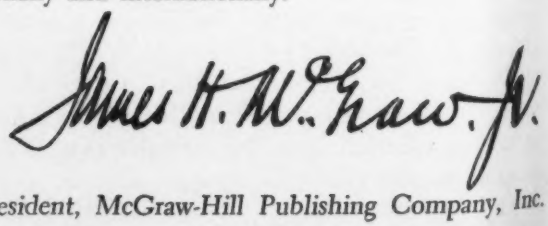
Above and beyond all the new developments is the gigantic job of producing millions of yards of standard fabrics of many colors and weaves. To produce all the uniform fabrics and blankets is in itself quite a job. The woolen and worsted industry has been doing it magnificently. Tent fabrics and summer fabrics produced by the cotton industry are no less a formidable assignment. I could point to myriad other jobs no less impressive.

The production man can indeed take pride in this record and behind the production man, the textile technician has been working tirelessly. Mildewproofing and waterproofing, so vital in a world at war, are in a new stage of effectiveness. A new process for waterproofing fabrics employs vinyl acetal plastic in place of precious rubber. Textiles that glow in the dark have been perfected for black-outs and other applications. American genius is solving problems many of which seemed insurmountable. Silk, for example, was something the Japanese thought we could never duplicate. A new synthetic textile filament that weighs but one eighth of the finest silk filament threatens to put the Japanese silkworm out of business after the war so far as we are concerned. The post-war possibilities of this development challenge the imagination.

Nor has the primary textile industry been alone in its contribution to the war. The textile machinery industry has been converted almost entirely to war work, save for a few facilities required to relieve extreme bottlenecks and supply essential maintenance and repair-parts.

Similarly, some textile mills, particularly hosiery mills hard hit by the silk and Nylon cut-off, are utilizing their space and skilled staffs to produce parts for war equipment.

The immediate significance of all this is its importance in the winning of the war. There is, however, a post-war implication which is important to the future of America. A mass production textile industry will serve civilians after the war more effectively than ever before, and will put new standards within the reach of millions. A long step has been taken toward that completely synthetic textile industry which some observers see in the future. The tempo of such changes has been accelerated tremendously. The oldest industry in the world, now one of America's largest, is showing a youth and vigor that promise much for the future... nationally and internationally.



President, McGraw-Hill Publishing Company, Inc.

FACTORY
MANAGEMENT AND MAINTENANCE

L · C · MORROW · EDITOR

Fundamental Factors in Manpower

Manpower matters still are uppermost as causes of plant management headaches. Designation of critical areas, with forced adoption of the 48-hour week in them, became a fact during the past month. The term "non-essential occupation" came out into the open but was quickly denied as a blood relative of manpower. "Deferment for occupation only" set Congress busily trying to give legal standing to deferment for married men. Commissioner McNutt announced the establishment of a labor-utilization consultant service to help industry get the most out of its manpower. More and more people questioned the need for an armed force of 11 million men. Bills for compulsory work service were pressed.

Amid and despite all the confusion and uncertainty, management is doing certain constructive things:

Adding to the worker ranks from the reservoirs of women, older men, partly disabled people.

Trying every procedure that appears to be feasible to reduce willful absenteeism.

Conducting management-labor production drives, accompanied by employee suggestion systems.

Adding to the total man-hours by reason of the longer work week for individuals.

Operating under local area manpower agreements to minimize turnover, lost time, piracy, and migration.

Carrying on health and nutrition programs that keep workers on the job.

Training and upgrading.

Bettering methods and equipment to increase the output per worker per unit of time.

These procedures are fundamental. Management is going to have to follow them through thick and thin. In and out of critical areas; with or without married men; helped or hindered by WMC labor-utilization consultants—management's manpower job is going to continue to be to get the most production per worker and to put enough people to work.

Some very worthy leaders of economic thought say that the only way to solve the manpower problem—having sufficient personnel for the armed forces, for agriculture, for essential civilian production and services, for war production, and for transportation—is by means of a law that will provide the power to conscript for working as well as for fighting. They say that only when people are told, "This is your job to help win the war; you will do it or else," will the requisite number accept the hardships of job transfer, migration, incompatible occupation, unpleasant living conditions.

I hope those leaders are wrong. I hope, and I believe, that when and if Washington makes known the total job requirements, subdivided into simple, easily understood classifications; and shows where the unfilled jobs are; and provides the means to get to them, and the living quarters where none are available—then those jobs will be filled without compulsion.

If considerable numbers of people must be assigned to jobs by government, there is bound to be so much disruption of family life; so much lost motion because of red tape; so much injustice, fancied or real, that after the war there may be much difficulty in winning the peace at home as well as abroad.

The course for industry is to continue to do the things cited here as its best contribution toward solving our pressing manpower problems.

L C Morrow

Tested Ways to Reduce ABSENTEEISM

The problem of industrial "absenteeism" is being honored with a great deal of talk and comparatively little action. True, there have been surveys, reports, and speeches by the score. But most of these have dwelt chiefly upon causes. Few have suggested cures—and only in general terms. In its own study of the problem, *Factory* decided to go one step beyond theoretical analysis of causes. So *Factory* set forth objectively:

1. To find industrial plants which either have maintained steady averages of less than 2 percent of working time lost due to absence or plants which have succeeded, by some means, in reducing absence by 50 percent or better over a period of time sufficient to provide a real test.

2. To study these plants, ascertain what methods were used—whatever these methods might be—and report on them.

The following report shows that something can be done and is being done to reduce the loss caused by absence of war workers from their jobs.

THE EDITORS

COINED IN PEACETIME to describe a fairly simple thing, the word "absenteeism" has been stretched completely out of shape by the wartime effort to make it include a host of complicated things.

It never was a very good word. Illness and injury, the chief causes of peacetime absence from work, are not really bad habits to be denoted as "isms." On the other hand, willful failure to report to a war job deserves a stronger name. No single word can encompass these extremes.

The very use of the word, in fact, begets confusion because the subject itself is as controversial as a point in theology. Some say "absenteeism" when they intend to describe "slackerism" alone. Others meanwhile seek to whitewash labor of blame by laying stress on all the causes of *involuntary* absence. Compounding the confusion is the fact that authentic national statistics on war worker absences simply do not exist. The problem is too new for that.

FACTORY proposes, therefore, to throw the word "absenteeism" out the window and will speak in this article only of: (1) Total absence due to all causes, (2) excused absence, and (3) unexcused absence.

"Scattered reports from a number of factories reflect rates (of total absence) ranging from between 2 and 3 percent up to 15 percent and more," says Duane Evans of the Bureau of Labor Statistics in the January *Monthly Labor Review*. Capt. Edward Rickenbacker has asserted that absence in the aircraft plants exceeds 10 percent. Louis Falzer, chief of the Statistical Analysis Section of WPB's War Production Drive Headquarters, has gathered reports from labor-management committees indicating a spread of 2.5 to 8.8 percent. Philip Murray, president of CIO, believes that total absences have recently averaged 4.5 percent for men, 6.5 for women.

FACTORY, striking an average of all the reliable figures it has been able to obtain, not only from manufacturers but also from mines and shipyards as well, estimates that total absences are probably running at a rate of at least 5.7 percent.

Menace to Victory

This, or anything like it, is serious. And potentially it is even more serious than it seems. Lt. Gen. William S. Knudsen reminds us that we are just now attaining a production level that is only 60 percent of our ultimate goals—and this when we are touching the bottom of our manpower barrel.

ONE OUT OF 17 OF THESE WORKERS WON'T REPORT tomorrow. While causes are many and varied, an estimated 46.1 percent of wartime absence is "unexcused." Can anything be done? *Factory* case studies (herewith) show that educational campaigns, with management and labor cooperating, can halve total absence

Think of the loss that 6 percent of absence will entail when our war workers total 20,000,000, as before long they will. At that rate, on a 48-hour week, we shall be losing the equivalent of the services of 1,200,000 workers. To make up for it, we might have to disrupt 1,200,000 lives unnecessarily in a labor "draft." Stated in terms of time, 6 percent of absence would cost us 2,880,000,000 man-hours per year, enough to build at least 50 battleships —enough, perhaps, to spell death and defeat for our fighting forces at some turning point when the safety of every American, his home, and his freedom may hang in the balance.

Endless Causes

What are the causes of war worker absence? Not long ago a governmental committee in Washington prepared an analysis under headings *A*, *B*, and *C* with 18 subdivisions and 48 sub-subdivisions. This listed not only the obvious things, illness and injury, but went thoroughly into housing and transportation difficulties, home responsibilities, child care, shopping difficulties, and time spent at rationing and draft boards. It also explored the psychological phases, such as low job morale, fatigue, lack of war consciousness, and even homesickness. It cited things for which management can be blamed, such as visible labor hoarding, poor production planning, and unhealthful working conditions, but it did not fail also to mention dissipation, drunkenness, surplus spending money, and plain laziness.

Withal, this committee missed several items which FACTORY has found in other lists, such as weddings, funerals, and court appearances. There is no end to the reasons why people don't show up for work. And there is no possibility of assessing their relative weight.

Unexcused Absence

Yet this shadowy turmoil can be brought partially into focus by a diligent search for the answer to one question: *How much of modern absence from work may be considered unexcused?* On this point most managements are reasonably uniform, if not uniformly reasonable, in the definitions they use.

First, however, it is necessary to ask: What is the extent of "normal" or peacetime absence? Philip Murray hazards 2.2 percent. This is close to most of the educated guesses on record. As a matter of fact, FACTORY has found plants today—big plants, war

WIN THE RACE AGAINST TIME!
TOOL AND DEVELOPMENT
LATHE DEPARTMENT
MILLING DEPARTMENT
DRILL PRESS • GRIND RAW STOCK
LARGE MACHINE ASSEMBLY Nº 2
BENCH • FIN. PARTS • INSPECTION MAINTENANCE
ASSEMBLY Nº 1 • PATTERN & CARPENTER • ELECTRICAL • TESTING
NIGHT SHIFT
ROME
BERLIN
DON'T BE LATE ★ ABSENT ★

When a departmental team wins 10 points for freedom from absence, tardiness, and time off, it posts another "bomber" stamp on the road to Tokyo or Rome or Berlin. Thus factory workers vie to cut lost time at General Electric Company's Cleveland works. This successful appeal to the competitive instinct originated with the labor-management committee, with the full cooperation of UERMWA-CIO

plants—with total absence averages of 1.5 percent, 1.05 percent, and even 1 percent. Very well, assume that 2 percent was the normal expectation. Between that and today's general 5.7 percent lies room for a large element of unnecessary absence.

How much? Again, positive national data are lacking. But clues are many. Not long ago the Associated Industries of Cleveland made a Monday morning survey of 151 plants employing 45,541 workers, 3027 (or 6.6 percent) of whom failed to report. Of these absences, 62 percent were, by the survey's standards, "unjustified." Individual plants make reports like these: Of all workers on sick leave, 20 percent, when visited, were not at home; of all absences investigated, less than 5 percent were due to actual illness.

Seeking further light, FACTORY then directly asked 10 representative war plants what percentage of their total absences they listed as unexcused. Many of the replies were made in the presence, and with the concurrence, of labor members of labor-management committees. And the average of these replies was 46.1 percent.

Week-End Bulge

Supporting the view that much absence is avoidable, the familiar "week-end bulge" appears in almost every graph of absences in plants where records are kept. (See chart on page 85). Pay days cause a similar bulge when they are scheduled to occur outside week ends.

Is there anything about a week end or a pay day that, by itself, will increase illness and accident or accentuate the problems of housing, transportation, shopping, unhealthful working conditions, and job morale?

The contrast between week-end absence and mid-week absence has undoubtedly been heightened, however, by the effect of President Roosevelt's Executive Order 9240 which forbids the payment of overtime and double time except at the end of 5 or 6 *consecutive* days of work. This was aimed at the tendency of workers to absent themselves on week days and return on week ends to collect extra pay. Issued last summer (primarily to reduce this type of absence) the order has been booted around considerably in its interpretations and reinterpretations by the Secretary of Labor. Currently it is considered fully effective.

The reduction in mid-week absences wrought by Executive Order 9240 further reinforces the view that much industrial absence is a matter of the worker's choice.

What Will Be Done

As discussion grows more intense, Washington will probably be expected to take some action on "absenteeism" and much mistaken debate will doubt-

less rage around that unfortunate word. One proposal (to authorize Selective Service reclassification of chronic shipyard absentees) is now before Congress. Others will probably follow. Congressmen will point out that willful absence has long been a wartime criminal offense in Germany and England (though the law has been but little invoked by the latter).

The federal government contemplates a national educational campaign with these aims: (1) To impress on management the necessity for keeping records of absence; (2) to increase workers' understanding of absence's effect on the war effort; (3) to increase the public's realization that absence has many causes; (4) to create worker pressure and public sentiment against chronic unjustifiable absentees; (5) to stimulate community-wide and inplant action on the problem by government, management, and labor.

Such a program, if adopted, should have its effect although it will have to compete with other governmental campaigns on other war issues.

What Is Being Done

Believing an immediate contribution could be made by presenting case histories, FACTORY set out to find companies which have dealt successfully with the problem of lost time within the plant. The objective: To report on the methods employed, whatever these might prove to be.

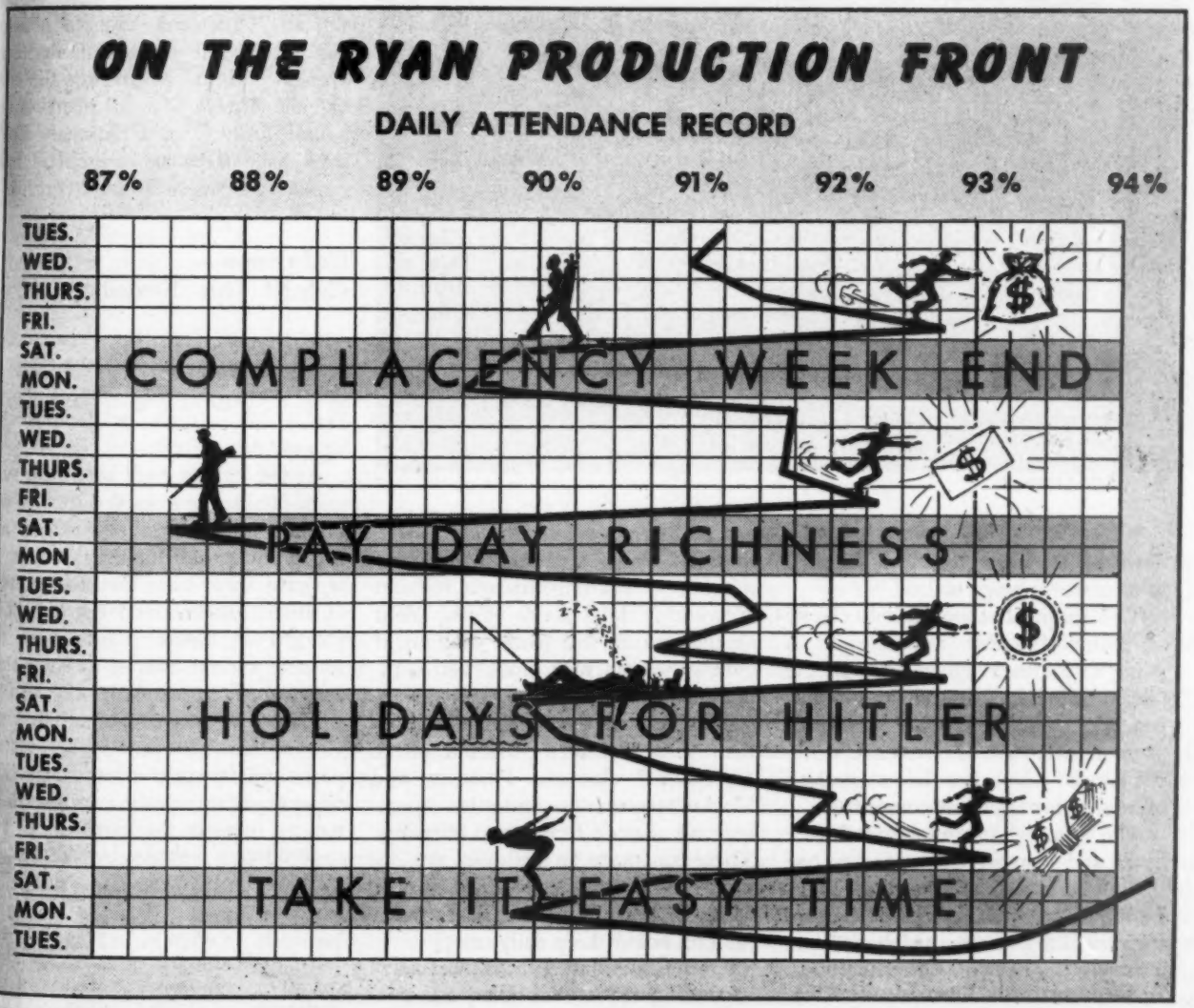
In its quest for practical, tested company examples, FACTORY carried a very definite yardstick, decided to limit its report strictly to: (1) Plants that have maintained a steady total absence average of 2 percent or less, or (2) plants that have achieved a sustained reduction in average total absence of 50 percent or better—no matter what the starting point. Discouraging words were heard.

"You won't find them," said more than one government official.

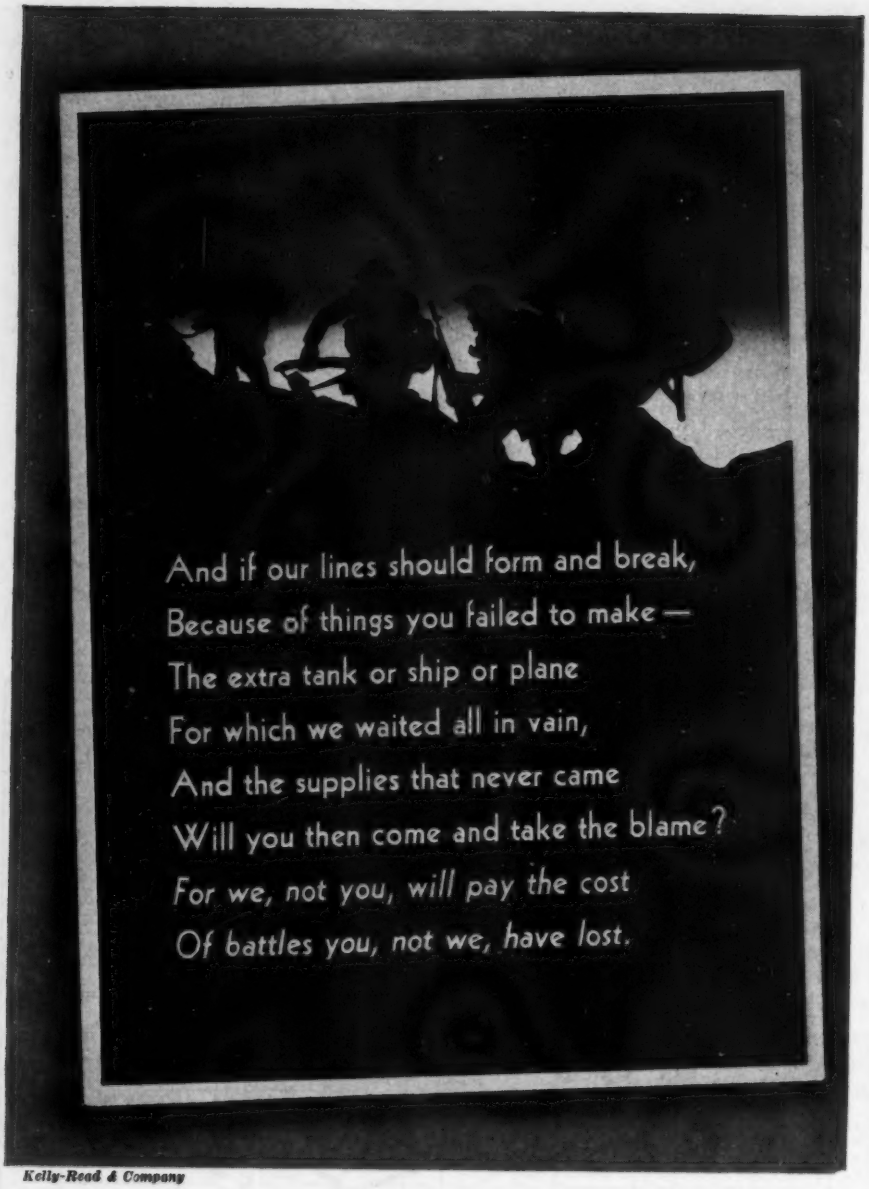
They weren't easy to find. Yet the success of the search suggests that the companies cited herewith are not the only ones that conform to the yardstick. Here they are:

Ohio Crankshaft—Swing Shift Does It

Ohio Crankshaft, Inc., of Cleveland, found in early August that it had a steady average of 5 percent total absence. Between August 21 and September 4, this figure was knocked



"Week-end bulge" in absences is vividly charted by Ryan Aeronautical Company. Upcurve on pay days and week ends is characteristic of the absence graphs in plants that keep attendance records, confirming belief that much (about 46.1 percent) of absence from war work is of the "unexcused" variety


And if our lines should form and break,
Because of things you failed to make —
The extra tank or ship or plane
For which we waited all in vain,
And the supplies that never came
Will you then come and take the blame?
For we, not you, will pay the cost
Of battles you, not we, have lost.

Kelly-Read & Company

SOME PREFER service men's appeals, like widely quoted poem (left). Many companies believe this approach is the best

down to 2 percent, has since declined to a current average of 1.5.

This impressive record is chiefly attributed by the company to a swing shift (described in "Round the Clock Schedules" FACTORY, November, 1942) coupled with a vigorous promotional attack on "Absence Without Leave" which has the cooperation of a labor-management committee.

The swing shift, running a 7-week cycle and assuring each worker one day off in seven, accomplished an almost instant reduction of 75 percent in week-end absences which had run as high as 20 percent. Other methods:

An unexcused absence is so classified when a worker fails to call in with an legitimate reason for absence in time to give his foreman a chance to cover the job. To such a worker goes this telegram: "Winning this war requires everybody's total daily effort. Your absence causes lost work. Call us at once so we can plan production without further loss."

Members of the personnel department visit absentees' homes to check on excused absence. Foremen and labor-management committee members talk severely to frequent offenders. These are made to feel also the opprobrium of needlessly draining the funds of the sick benefit plan. Plant bulletin boards keep daily score.

Ohio Crankshaft, Inc., is the quickly expanding wartime subsidiary and aviation division of Ohio Crankshaft Company. Transportation and housing problems are normal for the area. A steady accession of women (now above 20 percent) has not affected the success of the drive against absence.

Some facts worth pondering: Unexcused absence was 50 percent of the aviation division's total in August and is still 40 percent today. But—while unexcused absence has been slashed almost 75 percent, excused absence has followed it downward, declining over 60 percent. Meanwhile the total absence rates in adjacent plants of the parent firm, Ohio Crankshaft Company, have never been a problem, have run along between 1 and 2 percent.

Celanese— Credit Job Stability

In Newark, N. J., the Celanese Corporation of America consistently maintains a total absence average of less than 1.20 percent, as demonstrated by available records.

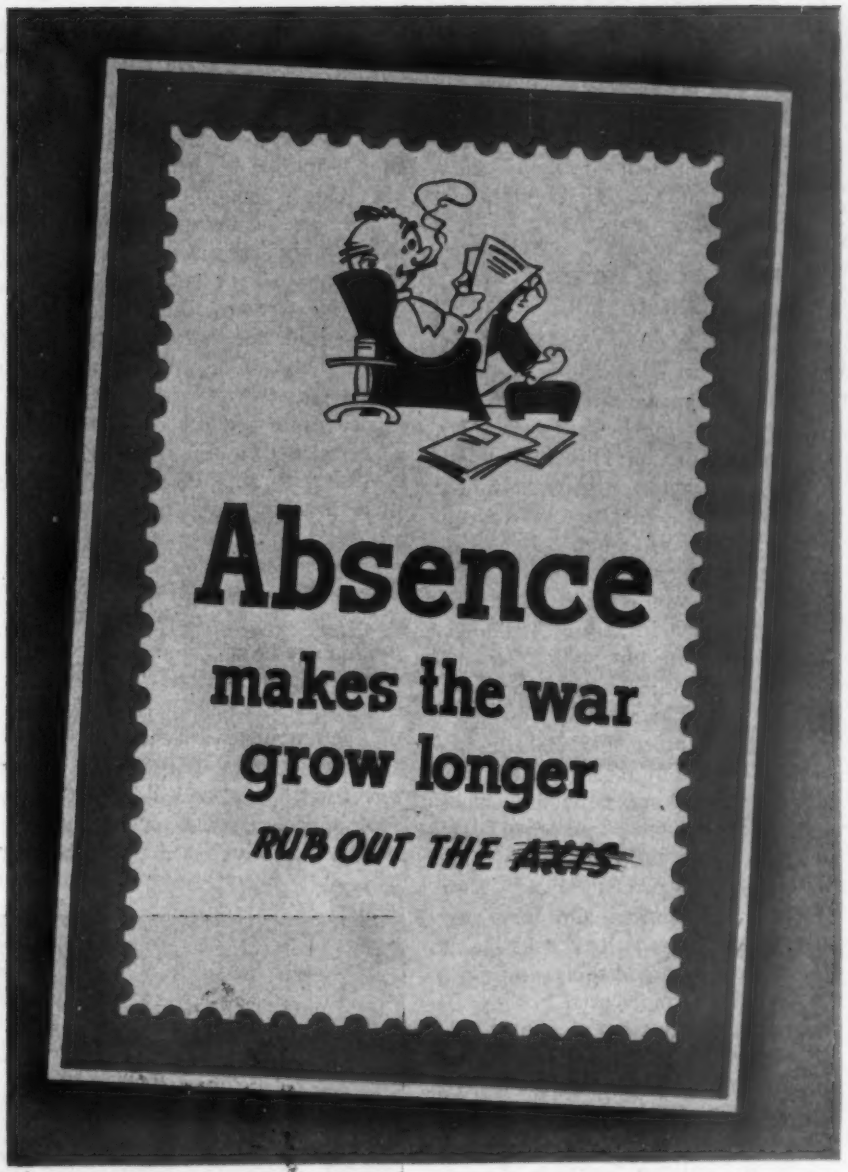
At the end of each month, a summary of absence is mailed to all superintendents, the works manager, and the president of the local union. A separate sheet also lists the number of absent workers and the lost hours charged to them. Copies are forwarded, via the union, to shop stewards who, in turn, talk it over with the workers. The War Production Drive Committee then analyzes these reports and forwards a letter signed by all committee members to any absentee out twice in the month.

Steadiness is shown by the record:

Month (1942)	Hours Worked	Hours Lost	Percent Lost
June	243,883	2754	1.13
July	244,046	2282	.93
August	236,640	2667	1.13
September	230,346	2358	1.02

"Since then," the company reports, "no change." Plant health facilities

OTHERS LIKE
appeals to pride and to fear of a long war, typified by this poster used in Goodyear Rubber drive



are excellent. Transportation and housing are not outstanding difficulties, since most employees live fairly near the plant. Withal, the record is exceptionally low. What's the answer? Here, in the Celanese Corporation's own opinion, is the significant, controlling feature:

Celanese is *not* a typical "war baby." Total personnel has expanded only about 20 percent. Every executive and supervisor has been on the job 5 years or more. While 80 percent on war contracts, the company has a product with an obvious post-war future. Employees, although they have as much spending money and face as many temptations as other war workers, value stability of their jobs, take no chances.

Erie Resistor—Women Hang Up a Record

At the Erie Resistor Corporation, of Erie, Pa., unexcused absence was singled out for special attack and made the objective of a vigorous drive in the company's largest department, *more than 90 percent of whose 600-odd employees are women.*

Beginning with an average 3.12 percent of unexcused absence in June, the figure in this department was steadily driven downward to November's 1.54. It has since held to a level of about half the original figure. Total absence was 2 percent in December, 1.72 percent in January.

Erie Resistor draws a rigidly limited definition of excused absence. The supervisors take pains to assign each girl to a job in which, after study, she is found to show no reaction to odors, heat, or paint fumes, because individual resistance to these things varies greatly. There is a plant infirmary with a nurse in attendance. The girls average about 24 years in age. Above 30 percent of them have housekeeping responsibilities. They work an average of 45 hours a week, and the plant is on a three-shift schedule. It is estimated that a decided majority of these girls have husbands, sweethearts, or brothers in the armed services.

Unawed by reports of the psychological complexities of employing large numbers of women, this company and its labor-management committee tackled the unexcused absence problem on an all-out basis.

Any absence is considered unexcused which has not been arranged for on the previous day through a leave of absence request handed to the supervisor and approved by the department manager. Telegrams are sent to absentees not so excused, and, unless a response is received within 24 hours, they are dropped from the payroll and restored without seniority on their return. If illness is the excuse presented, it must be certified by a physician.

The names of absentees are posted daily in the center of a placard at the entrance against a graveyard background of crosses. "What Kind of Cross Are You Responsible For?" is the headline challenge. The contrast is provided by the picture of a soldier receiving a Distinguished Service Cross.

Any employee with a record of three unexcused absences in a month may be subject to an additional two-day layoff unless a satisfactory explanation is

given. Frequent offenders may also be assigned to undesirable shifts.

An active promotional committee devises attractive victory posters and stages occasional rallies. A transportation committee helps to hold down lateness as well as absence.

Cletrac—Lost Hours Cut From 26,000 to 5000

At the Cleveland Tractor Company's plant in Cleveland there flourishes a labor-management committee which stands high in the good books of War Production Drive Headquarters in Washington. Its subcommittee on absenteeism got to work on unexcused absence in March, 1942.

Here are the results: 26,000 hours lost through unexcused absence in March; 22,000 in April; 16,500 in May; 11,500 in June; 9000 in July; 7500 in August; 7000 in September; 6000 in October; 5500 in November; 5300 in December; and 5000 in January. Concurrent records on excused absence are lacking, but it is believed to have constituted 50 percent of total absence at the start of the drive and to represent 80 percent today.

Both management and labor representatives are eager to emphasize the educational nature of their campaign.

"We have simply tried to show the men as a whole what they and their fellow-men in the armed forces stand to lose through unnecessary absence," said one. And this has been the phychological strategy of an intensive poster and bulletin campaign, the only one FACTORY has seen which stresses the monetary cost of absence to the workers themselves.

The committee on absence has undoubtedly benefited from the collateral work of able subcommittees on publicity, housing, transportation, health, and safety. All the committees meet regularly and submit monthly reports. The housing committee really helps people find homes; the transportation committee smooths the paths of long-distance commuters (some of whom live 40 miles from the plant); the health committee deals out "cold shots"; safety committee enforces use of goggles and steel-tipped shoes.

The expedients directed specifically against unexcused absence have been simple and few. A visiting nurse calls at the homes of those absent.

"But not to snoop," the subcommittee chairman, himself a labor representative, hastens to explain. "A man may think he has grippe when he really has pneumonia. Or he may have a communicable disease. These visits help to protect his health and that of his fellow-workers."

The chronic unexcused absentee is closely checked, however. First step is a heart-to-heart talk with his foreman. Next comes a visit of some formality from the subcommittee chairman. This failing, the culprit then gets a going over from the subcommittee as a whole. Only two men have resigned, unmourned, in protest.

And that, apparently, is about all there is to the program. Its sponsors are the first to insist that its success reflects in large measure the high morale of the plant's personnel and the general effectiveness of its War Production Drive committees. Cletrac employees are visibly proud of the company's war record (a 500 percent production increase achieved without additional facilities and with a working force that has expanded only 300 percent) and keenly conscious of their role in the war. No less than 99 percent were present on a Sunday to work without pay in the construction of a "Tractor for MacArthur."

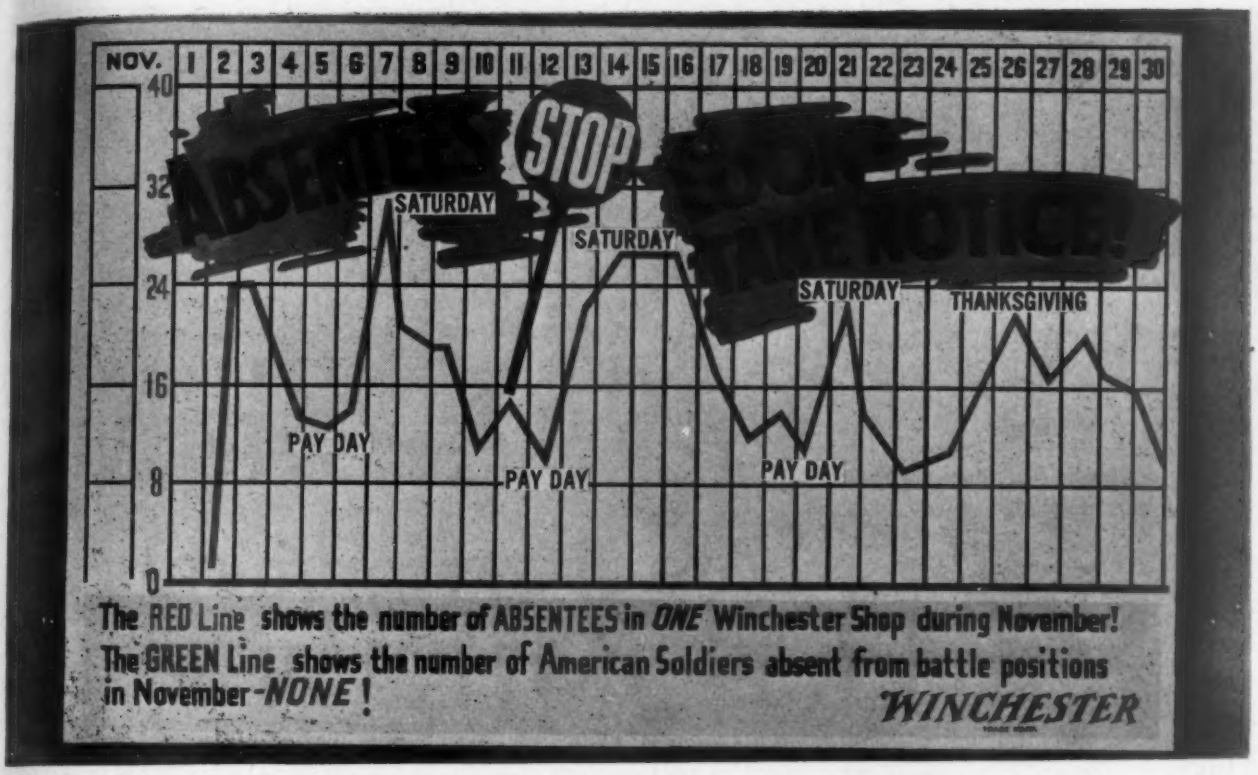
Cletrac workers average 35-40 years of age and work six 8-hour shifts weekly. The subcommittee reports that younger and newer employees were found to be responsible for most of the unexcused absence.

Here, by way of a sidelight, is an analysis which the committee once made of the causes of unexcused absence: Personal pleasure (hunting, fishing, movies, shopping) 25 percent; draft board summonses and unreported inductions which sometimes remained on the rolls as absences for nearly a week, 20 percent; drinking and weekend hangovers, 20 percent; "just too tired," 20 percent; dislike of foreman and "job shopping," 5 percent; illness or death in family, 5 percent; car breakdowns, 5 percent.

Winchester—Another Direct Hit

Beginning with an average total absence rate in excess of 6 percent, the attendance committee at Winchester

Ohio Crankshaft, Inc., of Cleveland, pushed total absence averages down from 5 percent to 1.5 percent by intensive campaign. Poster above played a part, but a "swing shift" is credited with biggest effect


NOV. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
40
32
24
16
8
0
STOP
SATURDAY
SATURDAY
SATURDAY
THANKSGIVING
PAY DAY
PAY DAY
PAY DAY
The RED Line shows the number of ABSENTEES in ONE Winchester Shop during November!
The GREEN Line shows the number of American Soldiers absent from battle positions in November-NONE!
WINCHESTER

The flat line at the very bottom is the "absence" curve of men in the armed forces. This provides a stern contrast with absences recorded on this attendance chart by Winchester Repeating Arms. Actually the Winchester's record has been excellent since the attendance committee began its comprehensive drive. Unexcused absentees are posted on AWOL board. Chronic offenders are dismissed

Repeating Arms Company, New Haven, Conn., pushed the figure down to 3.5 percent in the first few weeks of its drive and, except for holiday variations, has kept it close to that level ever since.

Here, again, unexcused absence was singled out as a major element of total absence and made the target of a direct campaign. The attendance committee keeps up a sustained educational program via the plant publications, the company radio program, and the publice address system. Man-hour totals of lost time are posted at the plant entrance.

Within the shop, an AWOL board lists the names of offenders on a poster bearing this caption:

"Herein are described the names of our unexcused absentees. Absence without leave is an offense and results in court martial in the Army. Our offenders are guilty of dereliction of duty and are subject to penalties provided in our rules."

Dismissal is the penalty for demonstrably chronic unexcused absence. At the start of the drive, about 35 percent of total absence was unexcused. Today it is down to 22 percent. The definition of excused and unexcused absence is left to the discretion of the foreman or department head.

A sidelight of interest is the fact that Winchester's women, 33 percent of the working force, account for 52 percent of total absence.

"In a great many instances, the money earned by a woman is over and above the income that her family has been used to living on," the attendance committee observes. "If, at the end of four or five days, such an individual feels that sufficient money has been earned during that week, the tendency is to remain out the last day or two of the week to take care of such household duties as a family woman might have been forced to leave unattended."

Cleveland Hardware—War Bond Prizes

"An AWOL worker is a deserter. These men were absent without excuse yesterday—"

Standard procedure? Yes, it seems to be. Yet, again, the daily posting of unexcused absentees was an effective feature of the campaign that enabled the Cleveland Hardware & Forging Company to reduce total absence averages from last July's 10 percent to today's 5 percent.

Other phases of the program have had equal or greater weight, however. Cleveland Hardware is the only plant included in this survey that has used attendance incentives. At the start of the drive, a $25 war bond was offered to each employee who, in the succeeding three months, missed no full days at work and was not late (or did not leave early) more than five times. In the first period 60 percent of the men got bonds.

By September average total absence had declined to 3 percent. In November it went to 5 percent, and in December got out of bounds again, returning to 10 percent. Since then, it has steadied down to 5 percent for January and less than 5 percent for February. This is thanks to continued diligent application to the campaign by the management and the labor-management committee's attendance subcommittee.

Daily attendance reports are made up by the foremen. The names of absentees are cleared from the foremen to the personnel manager. The homes

of absentees are visited either by the personnel manager or a member of the plant police force. Those genuinely ill are told to stay home and take care of themselves, while those without excuse are posted on the AWOL boards.

Daily total attendance records, meanwhile, are sent for complete analysis to the personnel department, the plant superintendent, the secretary of the labor-management committee, and the attendance subcommittee. Thorough study has revealed some interesting conclusions: (1) About 75 percent of current absence is unexcused; (2) in December and early January, however, actual illness rose for a time and the balance was 50-50; (3) about 50 percent of the current unexcused absence is directly due to a small group of "chronics" who constitute about 6 percent of the working force; (4) the day after pay day is still the day of highest total absence; (5) illness and accident, of course, lead the list of excused absences, while fatigue is rated the first cause of unexcused absence with intoxication second.

The labor-management committee does not neglect the promotional phases of its campaign. OWI films are shown thrice weekly in the lunch period. Former employees now in the service and home on furlough are given the run of the plant. Their letters from camp and from the front are published in the plant paper, with emphasis on those showing the long hours and rigor of military life.

High man-hour production levels indicate that morale in the plant is generally excellent, especially in view of the fact that the plant is not a model structure, the work is rough, the hours are long (average 60 a week) and the age of employees is high (about 42).

Some Conclusions

The individual reader, out of his own background, will draw conclusions from these examples more pertinent than any that FACTORY can point out, However, the case histories cited have certain features in common which justify the following observations:

1. Unexcused absence is the most susceptible, hence the most logical, first point of attack in any drive to increase wartime attendance at work, bearing in mind that total absence can never be driven below a certain level unless management wages incessant war on illness and accident.

2. Characteristic features of the successful case histories cited above include: (a) Consistency in keeping and analyzing records of absence; (b) simplicity of method and an absence of spectacular and drastic procedures; (c) consistency in applying the principle of group and individual pressure and in the use of promotional material (plants were found which had lost all their gains in the fight on total absence because they relaxed too long); (d) cooperation between labor and management in their common fight on the problem.

3. Virtually all the plants cited were working the 8-hour shift. This study provides no data on plants working a longer or shorter day.

4. The problems of housing, transportation, shopping, child care, housekeeping responsibilities—the social aspects of absence—are either not prominent in the localities touched by this study or they are not as important among factors of absence as is commonly supposed.

Late Developments in Manpower

EXPANSION of our war production program, coupled with the need to increase the strength of the armed forces, will require the services of an additional 6,400,000 persons in 1943. That is the War Manpower Commission's estimate of present needs. Labor shortages are already acute in many industrial areas; similar shortages are anticipated in other areas.

A 48-Hour Work Week

It was in recognition of the urgency of the current manpower situation that the President, on February 9,* issued an Executive Order establishing a minimum wartime work week of 48 hours. Purpose of the order, obviously, is to make more manpower available, and to increase production.

McNutt Explains

For quick understanding of the President's order and what it means to industry, FACTORY presents the following statements made by WMC Chairman Paul V. McNutt:

1. Until further notice the order will apply only to the following 32 areas of most acute labor shortage:

Bath, Me.	Manitowoc, Wis.
Bridgeport, Conn.	Sterling, Ill.
Hartford, Conn.	Brunswick, Ga.
New Britain, Conn.	Charleston, S. C.
Portsmouth, N. H.	Macon, Ga.
Springfield, Mass.	Mobile, Ala.
Waterbury, Conn.	Panama City, Fla.
Buffalo, N. Y.	Pascagoula, Fla.
Somerville, N J.	Wichita, Kan.
Baltimore, Md.	Beaumont, Tex.
Elkton, Md.	Cheyenne, Wyo.
Hampton Roads, Va.	Ogden, Utah
Washington, D. C.	Las Vegas, Nev.
Akron, Ohio	Portland, Ore.
Dayton, Ohio	San Diego, Calif.
Detroit, Mich.	Seattle, Wash.

2. Under the Executive Order it is essential that employers in these areas shall immediately make plans for placing all full-time employees on a regular work week of at least 48 hours. The order is not intended to interfere with work schedules designed to utilize workers who, on account of other activities or limitations, are available only for part-time work.

3. In those establishments operating on a work week of less than 48 hours in the specified areas, there shall be no further recruitment or hiring of new workers unless such establishments can go to a 48-hour week without need for releasing workers. Or unless, due to expansion or production schedules, more workers are needed.

4. The introduction of the 48-hour week shall be made in such manner as will assure the orderly absorption of released workers in other employment or in other occupations conducted by the same employer. Until March 31, 1943, no employer shall be required to increase his work week to

(Continued on page 236)

* At American Management Association's Personnel Conference, Chicago.

Final assembly is not a line, but a station where complete major sections are assembled

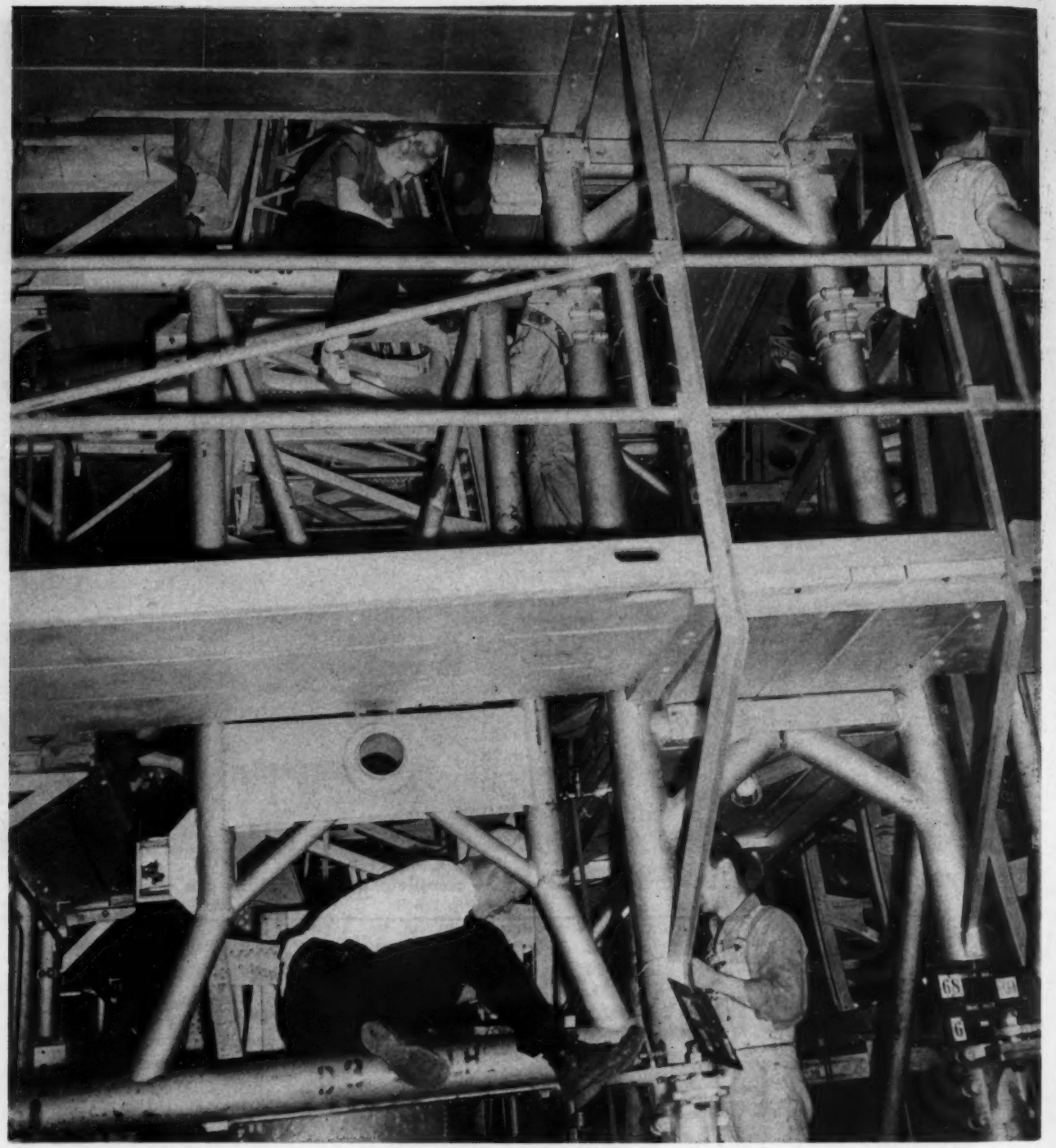
"Production Density"—to Save Floor Space

A COMPARATIVELY NEW principle, known as "production density," is being applied by Boeing Aircraft Company to the manufacture of Flying Fortresses and is enabling that organization to hang up outstanding production records.

Actually, production density means making the most efficient and greatest possible use of manufacturing facilities, concentrating production, planning a short flow of parts through the manufacturing processes so that the plant is a compact integrated unit. This eliminates over-expansion of plant facilities, and results in the conserving of strategic building materials.

It has been general practice in the aircraft industry to assemble airplanes into final form at the earliest possible time. The many interior installations are made afterwards, with workers swarming around, over, and in the hulking skeleton of the plant like flies around a lump of sugar. Such a practice, in large plane construction, is prodigiously extravagant of space. An aircraft of any kind, complete with wings, occupies a considerable amount of space. With a wing spread of more than 104 feet, and a body of over 70 feet, a Fortress occupies about one-third the space of a regulation football field.

To prevent this waste of space, Boeing has divided up its production into units or major parts of the plane. In effect, it has no final assembly line, but rather a final assembly fixture—a station at which, when complete major sections are joined, wires and tubes can be connected—and two positions for final inspection. By accomplishing installations within the



Wing jigs, customarily built parallel to the floor, eat up manufacturing space. So Boeing sets them up skyscraper fashion, three stories high. An entire battery of vertical jigs, in which several wings can be assembled, occupy no more space than two of the old horizontal wing jigs used to require

major assemblies of the plane previous to final assembly, little of the factory space is used by a completed aircraft.

Instead of one long assembly line, carrying practically the entire plane, Boeing uses several long, but compact, production lines for seven distinct major assemblies, in which each component part of the plane is virtually completed before final assembly has begun. The saving in space required for production is evident.

To keep this type of production from becoming bottlenecked, Boeing instituted simultaneously an extensive subassembly procedure. Subassembly feeds into major assembly, maintaining a smooth, even flow of material through the various stages of manufacturing. The length of travel of raw materials through to the finished aircraft is short. They all enter the plant through a single channel.

Boeing's density system of production is a fluid one enabling rapid adoption of design changes. A superior war plane cannot be built in one frozen pattern. As this nation develops a superior weapon, the enemy eventually finds a vulnerable spot, or a means of combating it. This requires a change sometimes of

Fuselage tail sections for Flying Fortresses are constructed as major units, with most of their interior fittings complete. Here the sections have been removed from the jigs for finishing touches prior to being moved by crane to join the forward fuselage sections on the final assembly floor

a minor nature, sometimes a major design feature. Because of the flexibility of Boeing's scheme of production, changes can be made in a minimum of time and without affecting the speed of production schedules. The prime example of this fluid system in operation was the change-over from the B-17E to the B-17F. Although the new ship involved more than 400 design changes, production of the new model followed that of the old without interruption of production schedules, or without a shutdown for changing production lines.

Production density requires that floor space be utilized to the best possible advantage. Wing jigs, for example, have been customarily set up parallel with the floor. A series of such jigs would require an astonishing amount of floor space. Boeing built its skyscraper fashion, three stories high, putting up a battery of jigs vertical to the floor. One battery, capable of producing several wings, occupies a space equivalent to two horizontal wing jigs. More impressive than the size of the jigs, however, is the fact that they contain ample working room for large crews of workers on each floor or story, with plenty of light and ventilation. The jigs can be partially dismantled to remove the completed wing, and quickly reset. Adjustments on the jigs enable inspectors to check their accuracy to limits of 0.0005 inch.

Wiring used to be a bottleneck. In former times, it was necessary to pull each individual wire through conduit. About a year ago the new plan was devised. Entire wiring assemblies can be put together in subassembly operations by girls of little experience. The new method is foolproof. Wiring assemblies are made on large plywood boards. Pegs, screwed into boards, mark bends in the wires. A red wire follows a certain course painted on the board, red and black wire a second course. The wiring assemblies are complete when they leave this department and need only be attached to the proper portions of the ship.

A Case History in On-the-Job Training

Occasionally, in these days of wartime operation, the author of an article must remain anonymous. This is one of those cases. It is a *bona fide* example of quick training from one of the finest companies in America. Here it is, in the words of the plant operating man responsible for the job:

When the pressure of war operations was put on our maintenance department to take on new men, not only to fill necessary replacements but also to put our operations on a 24-hour basis, seven days a week, we had the bright idea of hiring high school boys and other young men for certain work which was not too complicated and which did not require the knowledge of real mechanics.

Our experience was enlightening. The boys could learn to use simple

(*Continued on page 192*)

How long should it take for this girl to learn her job? This article tells how to find out

How to Figure Learning Time

R. C. SMYTH, Personnel Manager, Fort Avenue Plant, Bendix Radio Division of Bendix Aviation Corporation, Baltimore

How MANY HOURS should it take the average inexperienced worker to learn to perform a given activity satisfactorily? Most managements have no idea. Yet this information is a "must" if best use is to be made of manning tables (FACTORY, Nov., 1942) or replacement schedules (Jan., 1943).

Because this is so, and because industry still has to train hundreds of thousands of new employees, most of whom have never worked in a factory before, the following method of predetermining learning time should prove useful. It was developed over a two-year period and tried out in both a large mail order house and in the plants of a large radio manufacturer. It has been applied to both shop and office jobs. The plan must not be confused with the various rating plans designed to determine the *basic hourly rates* of different jobs. The object of this point rating system is to determine the *learning period* of an activity.

In working out this plan it was necessary first to determine what factors affected the learning period of any activity. After much experimentation a list of six factors was compiled:

1. *Length of Job Cycle*—Learning time is greatly affected by the length of the cycle. Long cycles usually have more complex motion paths to be learned. For convenience, the time value which must be obtained from the wage incentive standard, or estimated in conjunction with the supervisor or time-study man, is expressed in *pieces per hour.*

2. *Education*—The proper degree of education necessary to handle the activity must be considered. On the

Table I. Point Value of Factors

FACTORS	1st DEGREE	2nd DEGREE	3rd DEGREE	4th DEGREE	5th DEGREE
1 — Length of Cycle	8	16	32	64	128
2 — Education	2	4	8	16	32
3 — Rules and Regulations	10	20	40	80	160
4 — Rhythm and Manual Dexterity	7	14	28	56	112
5 — Mental Dexterity	5	10	20	40	80
6 — Physical Demand	8	16	32	64	128

rating form education is broken down into years of schooling.

3. *Rules and Regulations*—The time to learn any activity is greatly affected by the number of rules and regulations to be memorized. All written, verbal, or implied rules and regulations that an operator must know are considered under this heading.

4. *Rhythm and Manual Dexterity*—The degree of rhythm and manual dexterity must be carefully considered. Rhythm results from the memorizing of a free and unimpeded motion path. Free, loose, and ballistic movements result in rhythm and a high degree of automaticity. Rhythm or manual dexterity can never be maintained by conscious effort.

5. *Mental Dexterity*—This factor appraises the amount of mental dexterity required to perform the job satisfactorily. A short cycle activity usually requires a fairly high degree of mental dexterity. Watch out, however, for purely automatic activities.

6. *Physical Demand*—The degree of physical stamina required by the activity should be appraised. Sliding, lifting, or carrying heavy objects should receive a higher rating. Strength must be considered as a factor in learning time because in activities in which it appears, a definite time interval elapses in adjusting sets of muscles to the strain of a constantly repeated new activity.

ANALYST R. V. Jones DATE 12/29/42

NAME OF OPERATION Spin and Tin

DESCRIPTION OF OPERATION Twist exposed ends of wire in fingers, dip in flux, dip in solder pot, and lay aside.

WAGE INCENTIVE STANDARD NUMBER I-142

FACTORS	DEGREE 1	2	3	4	5	POINTS
1. Length of Cycle	X					8
2. Education	X					2
3. Rules and Regulations	X					10
4. Rhythm & Manual Dexterity			X			28
5. Mental Dexterity	X					5
6. Physical Demand		X				16
TOTAL POINTS						69

Figure 1. Degrees are filled in, and matching points taken from Table I. Total number of points gives hours of learning time (Table II)

Each of the six factors is composed of five degrees. In determining the learning time for any given job, the form illustrated in Figure 1 is used. The degree of each factor required *by the job* is selected. Care must be taken to rate the job itself and not the people working on the job. It must be realized that the *first degree* is for any job that requires the minimum of that factor and the *fifth degree* is for any job that requires the maximum. Care must be taken in selecting the degrees to compare all jobs mentally, factor by factor.

After the degrees selected have been entered on the form illustrated in Figure 1, the actual points are filled in from Table I. The points are then totaled, and the hours of allowance taken from Table II.

The six factors, each broken down into five degrees with a description of each degree as an aid in rating the job, are shown in Table III.

Table II. Allowed Hours

Points	Hours of Allowance	Points	Hours of Allowance	Points	Hours of Allowance
0- 40	2	118–124	96	220–232	224
41- 47	8	125–131	104	233–245	240
48- 54	16	132–138	112	246–258	256
55- 61	24	139–145	120	259–271	272
62- 68	32	146–152	128	272–284	288
69- 75	40	153–159	136	285–297	304
76- 82	48	160–166	144	298–310	320
83- 89	56	167–173	152	311–323	336
90- 96	64	174–180	160	324–336	352
97–103	72	181–193	176	337–349	368
104–110	80	194–206	192	350–362	384
111–117	88	207–219	208		

How Plan Works

As an example of how the plan works, let us take the simplest job in the radio industry, spin and tin wire. Six-inch strands of wire from which the insulation has been removed for $\frac{3}{8}$ inch at each end are used. The exposed wire is rapidly spun or twisted between the finger tips, dipped in flux and then in molten solder, shaken to remove any excess solder, and then laid aside. Six or eight wires are usually so handled at one time.

Using the form illustrated in Figure 1, the first degree was selected for each of the first three factors; the

third degree for the fourth factor; the *first degree* for the fifth factor; and the *second degree* for the sixth factor. When the corresponding points are selected from Table I, they are found to total 69. Using the figures shown in Table II, it then appears that 40 hours must be allowed for the average operator to learn the task requirements of the job.

This may seem an excessive period of learning time. It must be remembered, however that this is not time required to learn only how to do the job but also to be able consistently to meet production requirements. Also, a definite period of adjustment to strange surroundings must be taken into consideration and allowed for.

Progress Records

Records of each individual's productivity on the job should be kept daily by the instructor. Because people learn faster when they know how they are progressing, each new operator should be told the results for the previous day and the number of pieces per hour expected for that day. Each day's results for the group should be posted on a bulletin board in the working area so that social pressure and competition will urge all members of the group to do their very utmost.

Records are valuable to the instructor in determining which individuals need further instruction. Of course, after the learner reaches "task," the stimulus of the wage incentive plan will tend to pull her above task.

Learning allowance starts the minute the new employee reports for work and is sufficient to bring the average employee up to "task." In a plant that operates on a day work or hourly rate basis, multiply the total points by 0.6 before selecting the hours of allowance from Table II.

The basic data on which this plan was founded were secured from the employment histories of thousands of people in the branches of a large mail order house and in the employment records of a radio manufacturer who had expanded 1200 percent in the last three years. Both office and factory jobs are covered in the basic data, as well as jobs calling for both sexes. The records kept in these two companies regarding the length of time it takes for the average previously inexperienced person to reach "task," form the basic data of this analysis.

This system is applicable to only about 70 percent of all factory and office jobs. However, about 90 percent of all training of green personnel is done on these jobs.

Table III. Description of Rating Factors

1. LENGTH OF JOB CYCLE

Degree	
1st	Over 240 units per hour
2nd	Over 60 and up to and including 240 units per hour
3rd	Over 15 and up to and including 60 units per hour
4th	Over 4 and up to and including 15 units per hour
5th	Up to 4 units per hour

2. EDUCATION

1st	Equivalent to 8th grade
2nd	Equivalent to 2 years of high school
3rd	Equivalent to 4 years of high school
4th	Equivalent to 2 years of college
5th	Equivalent to 4 years of college or over

3. RULES AND REGULATIONS

1st	Simplest job. Rules and regulations are at a minimum
2nd	Easy job. Type of job performed by unskilled labor
3rd	Average shop or office jobs. Type of job performed by semi-skilled labor
4th	Complex work. Requires the understanding of many rules and regulations. Type of job performed by skilled labor
5th	Very complex work. Requires the understanding of a great number of rules and regulations. Type of job performed by the highest type of craftsman

4. RHYTHM AND MANUAL DEXTERITY

1st	A minimum of rhythm and manual dexterity required
2nd	Some rhythm and manual dexterity required
3rd	A medium amount of rhythm and manual dexterity required
4th	Considerable rhythm and manual dexterity required
5th	Highly rhythmic job requiring a great deal of manual dexterity

5. MENTAL DEXTERITY

1st	A minimum of mental dexterity required
2nd	Some mental dexterity required
3rd	A medium amount of mental dexterity required
4th	Considerable mental dexterity required
5th	Job requires a high degree of mental dexterity

6. PHYSICAL DEMAND

1st	Light work, requiring little physical effort
2nd	Light physical effort required. Working regularly with lightweight material or occasionally with heavy material. The second degree would be given for any standing activity
3rd	Considerable physical effort, working with material of average weight. Rest periods are fairly frequent, because of machine attention or nature of work
4th	Sustained physical effort, working with material of average or heavy weight
5th	Continuous physical effort of the hardest type. Working regularly with heavy material

Tests That Aid Wartime Hiring

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Reference Dept.

GUY B. ARTHUR, JR.
Industrial Relations Manager, R. G. LeTourneau, Inc., Peoria, Ill., and Toccoa, Ga.

With industry scraping the bottom of the manpower barrel, there is more need than ever for pre-selection tests that will quickly weed out applicants who won't do, help to evaluate those who will

An Eight-Page Editorial Feature

1. Weeding Out the Unfit

A new test, which we call our Pre-Selection Test, has proved an invaluable aid to us in making our selection procedures fit current conditions. With it we can quickly pick out applicants who are qualified for low-class jobs in our plants and eliminate those who do not possess even these minimum qualifications.

For five years we have labored to establish definite standards of employment, including certain specific test minimums for our major occupations. An applicant for a welding trainee job, for example, had to have a nominal amount of confidence, an ambivert personality, some number facility, average induction powers, nominal reasoning ability, and above-average mechanical ability.

The following of this procedure in the selection of welding trainees had begun to show definite results, and we seemed to have a fairly definite correlation between test grades and success in this major occupation – major because 25 percent of our employees are engaged in it.

Similarly, we had worked out test minimums and maximums for most of our more important occupations. In fact, over a period of time we hoped to develop even better figures for the trades already considered in view of larger samples, and we expected to cover every type of work found in our organization. Management and supervisors were coming to depend on the tests as a basis for upgrading and training. Only the best applicants were being added to our force, and all of us felt a keen sense of satisfaction in the knowledge that we were cutting costs and at the same time building a better foundation than we had ever had in the past.

Then the War

About this time we were rudely awakened. Our own country was actually at war. Our entire output was to go to the Army. We were glad such sound selection procedures had been established because demands for more and more production were coming in daily. That meant increasing our force – but with everyone else doing the same thing and the armed forces taking more and more men we soon had to relax our high selection standards. This was not serious at first, but soon a week seldom passed without one of our personnel managers asking permission to lower another established standard, or, even worse, to reduce one of the minimums still lower.

Along with this forced lowering of known good practices we were having the highest selection cost in our history. This was caused by giving our Mental Abilities Analysis and Mechanical Aptitude Test to a large number of applicants whose ability to get even the lowered grades was far below past averages. In other words, the percentage of failures was increasing day by day in each plant.

Previously, we had not wanted to employ anyone who could not go on up in the organization. Now we needed men who could perform a single job or operation. Even so, we knew they must have some knowledge and ability to do even the simplest job. As a result we devised what we call a Pre-Selection Test, whose use points out to our employment managers those applicants who have the minimum abilities needed on low-class jobs, and at the same time eliminates those who do not have even these almost negligi-

PRE-SELECTION FORM

Date _____

Your name _____ Male ___ Female ___

Your age _____ Your height _____ Your weight _____

Are you married? ___ or single ___ How many dependents? ___

Check the last school grade completed: 1 2 3 4 5 6 7 8 Grade School

1 2 3 4 High School 1 2 3 4 5 6 College

Are you an American citizen? _____

If not, where were you born? _____

Where is your draft board? (City) _____ (State) ___

What is your selective service classification? _____

What is your present address? (Street) _____

(City) _____ (State) ___ Tel. No. _____

What is your occupation? _____

Have you registered at a government employment office? ___

Where? _____

DO NOT WRITE IN THIS SPACE	P	F	G	E
Grade I				
II				
III				
IV				
V				
Appearance				
Personality				
Experience				

Classification tests? _____

Date _____

On the following two pages is a series of simple tests

Each part has its own instructions

Follow these instructions carefully

There is no time limit to these tests

Turn in this paper when you are through

Now turn the page and begin

Pre-Selection Test, whose cover is shown two-thirds actual size, was designed to point out applicants with the minimum abilities needed on low-class jobs. It quickly eliminates those who do not have even these negligible abilities . . . On the facing page, the first four parts of the test are reproduced full size

WARTIME HIRING

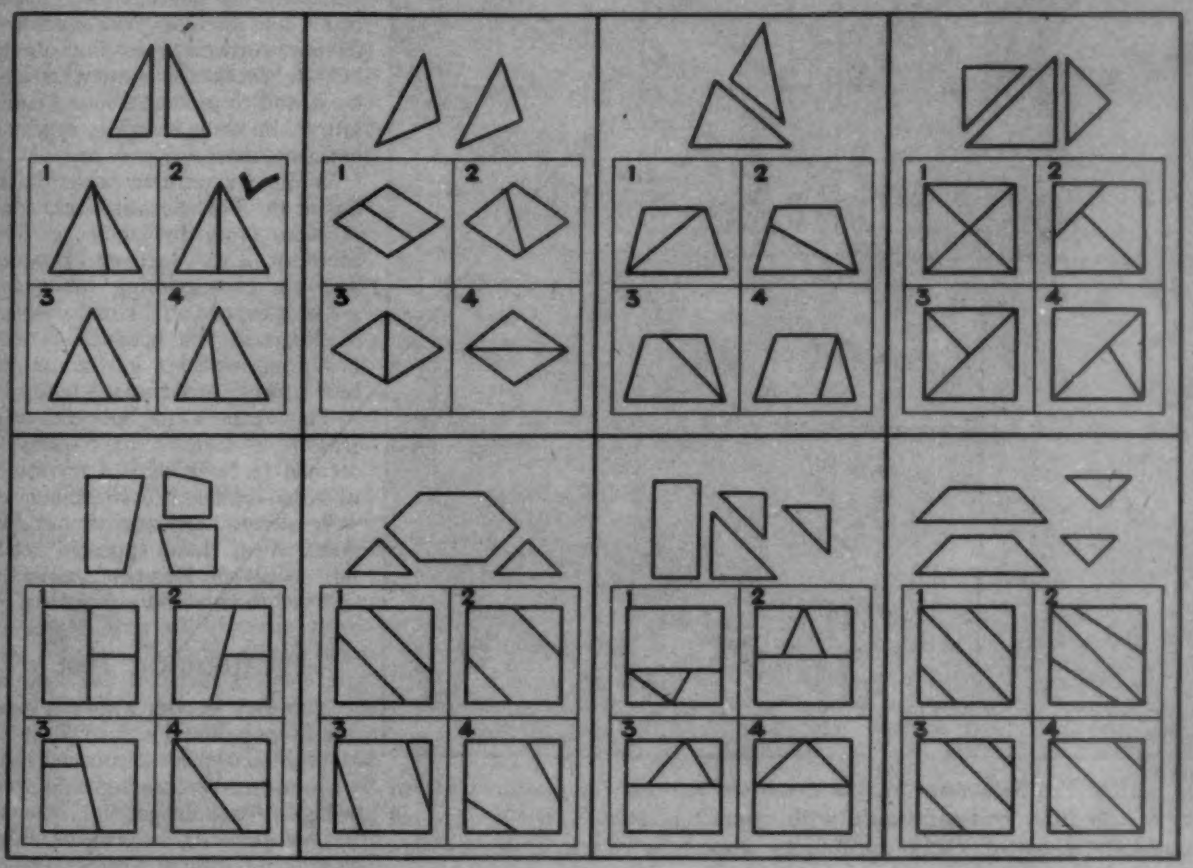
Part I

Work the following problems. The first one of each group is worked correctly.

Add			Subtract			Multiply			Divide		
7	21	35	9	14	43	6	11	27	5|25	3|81	4|104
+8	+32	+27	−4	− 8	−19	×3	×6	×4	5		
15			5			18					

Part II

One of the four figures in each large square is made up of the parts shown above that square. Check the one figure in each square which is made up of the parts shown above the square. The first square is checked correctly.



Part III

In each group of numbers, what is the next number? The first is worked correctly.

4 5 6 7 8 9	7 6 5 4 3 ___	3 6 9 12 15 ___
2 4 6 8 10 ___	16 14 12 10 8 ___	4 5 7 8 10 ___

Part IV

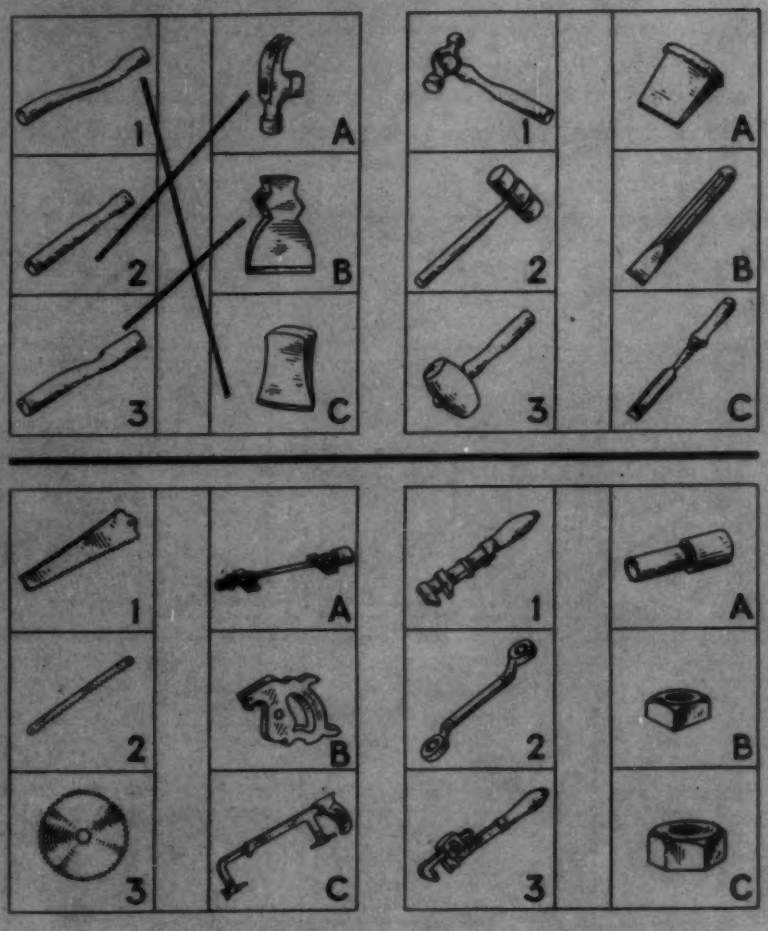
Follow the instructions carefully. The first sentence is worked correctly.

If Chicago is not in Georgia, put a check-mark here ✓ Fill in the blank in this sentence. "There are _____ days in a week." If New York is the capital of the United States, put your initials here _____; but if not, write your first name here _____ If January has thirty days give your age here _____; but if not sign your last name here _____

CONTINUED ON NEXT PAGE

Part V

Each numbered picture is used with a lettered picture in the same group. Draw a line between the numbered pictures and the lettered pictures in each group which are used together. The first group is worked correctly



Fifth part of Pre-Selection Test is designed to turn up people with at least a speaking acquaintance with common tools. (Two groups of pictures not shown.) Only applicants who pass are interviewed

ble abilities. Even the low-rated jobs require some number facility, perception, power of induction, ability to follow written instructions, and mechanical aptitude.

The Pre-Selection Test consists of a few questions or problems on each of the above abilities (see preceding page, also illustration on this page), to point out in a rough way whether the applicant has any such ability or not. It was not designed as a measure but only as a guide or rough screen. The first page asks those few basic questions that are needed by our employment managers in lieu of a formal application blank (see illustration on page 98). At the bottom of the page is space to check whether the applicant is *poor, fair, good,* or *excellent* in each of the abilities included in the form, as well as room to rate him on appearance, personality, and experience.

Our second objective is to find those capable of taking our complete battery. If an applicant gets better than the minimum grade on the Pre-Selection Test, he is eligible for one of the low-class jobs. If he gets a grade above the maximum for the low-class jobs, he is given our standard battery, which shows us which one of many trades he is most apt to succeed in. The Pre-Selection Test is not given to applicants who obviously have the capacity to handle the battery. It has no time limit, is self-administering, and easy to grade. As a result, little of our testing staff's time is needed. It shortens the preliminary informal (stand-up) interview considerably and allows the employment manager to handle almost twice as many applicants daily.

The third objective was to reduce selection costs, and it may be seen from the above that this has been accomplished. It is a rough test, to be sure, but so much better than merely talking to a man and guessing whether or not he will do.

On page 4 of this Pre-Selection Test we printed our regular formal interview form. After the applicant has completed the Pre-Selection Test satisfactorily, he fills out an application blank, and then is given a formal interview. Answers to leading questions help to check the statements he has made and to provide a sound basis for rating him on personality, appearance, and experience.

While we were working the bugs out of the Pre-Selection Test, another problem arose to harass us in our southern plants. Increased production and an ever-declining labor supply made it expedient for us to make use of Negroes. We tried them out on heavy routine labor jobs and then on heat-treating and furnace tending.

They proved to be good after a reasonable amount of training, and seemed to be contented on this type of work—unlike the white men who were always too warm or not feeling good. Also, there appeared to be a fair supply of Negroes available, but most of them could not read or write.

Reading Test

You may wonder why in times like these we should concern ourselves with illiteracy, but if you had lost one of your men because he could not read a high-voltage danger sign, you would also take interest. Investigation showed that many of these Negroes who could not write were able to read the more common signs in our plants. In view of this, and because we need an ever-increasing number of such men, we made up a simple reading test. It is a mimeographed sheet on which the interviewer can write the applicant's name, address, and other pertinent data. Printed in ½-in. letters are *Danger, Stop, No Smoking, No Admittance, First Aid, Exit, 11,500 Volts, Hands Off,* and *Be Careful.*

The applicant is asked to read these words, and each one read correctly is checked by the interviewer. On the back of the reading test is our regular interview form. If the applicant passes the test, the interviewer completes the interview form and sends the man on to the medical department.

2. Analyzing Mental Abilities

As explained in the foregoing, an applicant who gets a grade on the Pre-Selection Test above the maximum for low-class jobs is given our standard battery of tests, which are designed to show which one of many trades he is best fitted for. This battery consists of O'Rourke's Mechanical Aptitude Tests I and II; Guilford's Personality Inventory of Factors S, T, D, C, and R; and our own Mental Abilities Analysis. The latter is an adaptation of the tests devised by Dr. L. L. Thurstone of the University of Chicago. (Mechanical Aptitude Tests and Personality Inventory are not shown. For tests used in the Mental Abilities Analysis, see figures here and on succeeding pages.)

Each part of our Mental Abilities Analysis is given and graded separately. The whole test takes about 35 minutes and gives us a picture of the applicant's mental set-up, just as Guilford's Personality Inventory gives us a picture of his personality. Unlike "I.Q." tests, which provide only a lump sum idea of one's mentality that is warped by high or low individual abilities or which buries a few excellent abilities in a number of poorer abilities, the primary mental ability testing idea points out good and bad abilities so far as we know them.

To carry on with this theory of individual abilities, we have run correlations between the primary abilities of our men and their success in a given trade or skill. It was at once apparent that only a few abilities, and these varying from job to job, had any correlation with success. For example, we have found that an inspector in our plants needs good grades in only two of the abilities, perception and visualizing, as well as good mechanical ability and an ambivert personality.

Required Scores

Minimum standards for machinist trainees include perception (70), number facility (70), visualizing ability (55), induction (70), and mechanical ability (90). Minimum requirements for welders include number facility (40), induction (40), and mechanical ability (70). In like manner, we have set up minimum standards for supervisory trainees which consist of perception (70), number facility (70), visualizing ability (75), memory (75), induction (60), reasoning (50), mechanical ability (90).

It must not be thought that we do all our hiring solely on the basis of tests. Actually we use them merely as an aid to our other employment procedures. Nor should any reader believe from the above that our minimums are beyond reproach, because actually no one really knows just how many basic mental abilities there are, and we have not had sufficient experience with them to confirm our findings with extremely large groups over a long period of years.

We do feel, however, that this primary mental ability procedure is the solution to mental testing, and that through its use it will be possible in the future to get every worker into that phase of work for which he is best fitted mentally. It will be possible to make use of each person's outstanding mental abilities and to develop those necessary to success in a given occupation but weak in a given individual. All this will lead to a larger number of successful and therefore happier people in industry.

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I. SPEED OF PERCEPTION

MACHINES	COINS	HAND TOOLS	LIQUIDS	ANGLES
Banana	Penny	Bee	Water	Light
Heir	Magic	Harp	Iron	Copper
Engine	Flute	Screw	Grate	Loft
Swim	Dollar	Vision	Shine	Staple
Mince	Tint	Learn	Oil	Face
Raven	Snake	Strap	Spell	Prude
Four	Duke	File	Sight	Navy
Mower	Leaves	Straw	Chair	Acute
Dent	Jingle	Table	Apple	Fish
Rain	Time	Girls	Six	Hoop
Summer	New	Ship	Copper	Five
Motor	Couch	Plane	Figure	Onion
Tail	Front	Moon	East	Spell
Comma	Dime	Two	Double	Right
Cover	Crust	Civic	Milk	Wren
West	White	Mine	Time	Lemon
Naval	Screen	Good	Creek	Sheep
Result	Hinge	Lamp	Juice	Liver
Knot	Nickle	Nine	Erase	Relic
Heart	Canvas	Wrench	Theme	Sauce

Each of the tests in the Mental Abilities Analysis is preceded by an instruction sheet. To test speed of perception, the applicant has to underscore in each column the words in the same classification as the key word. (Only five of sixteen columns are shown.) The correct words in the first column are underscored by way of illustration

CONTINUED ON NEXT PAGE

II. NUMBER FACILITY

ADDITION		SUBTRACTION		MULTIPLICATION	DIVISION
12 13 14 39	16 21 17 54	123 −108 15	175 −73 102	12 × 3 = 36	18 ÷ 3 = 6
C✓ I___	C✓ I___	C___ I___	C___ I___	C___ I___	C___ I___
11 23 37 71	15 27 17 49	116 −18 88	742 −142 500	4 × 14 = 53	35 ÷ 6 = 5
C___ I___	C___ I___	C___ I___	C___ I___	C___ I___	C___ I___
				20 × 7 = 141	56 ÷ 7 = 8
				C___ I___	C___ I___
43 26 13 82	59 16 12 86	188 −93 95	642 −77 575	6 × 13 = 78	42 ÷ 9 = 5
C___ I___	C___ I___	C___ I___	C___ I___	C___ I___	C___ I___
				11 × 11 = 122	107 ÷ 5 = 15
				C___ I___	C___ I___

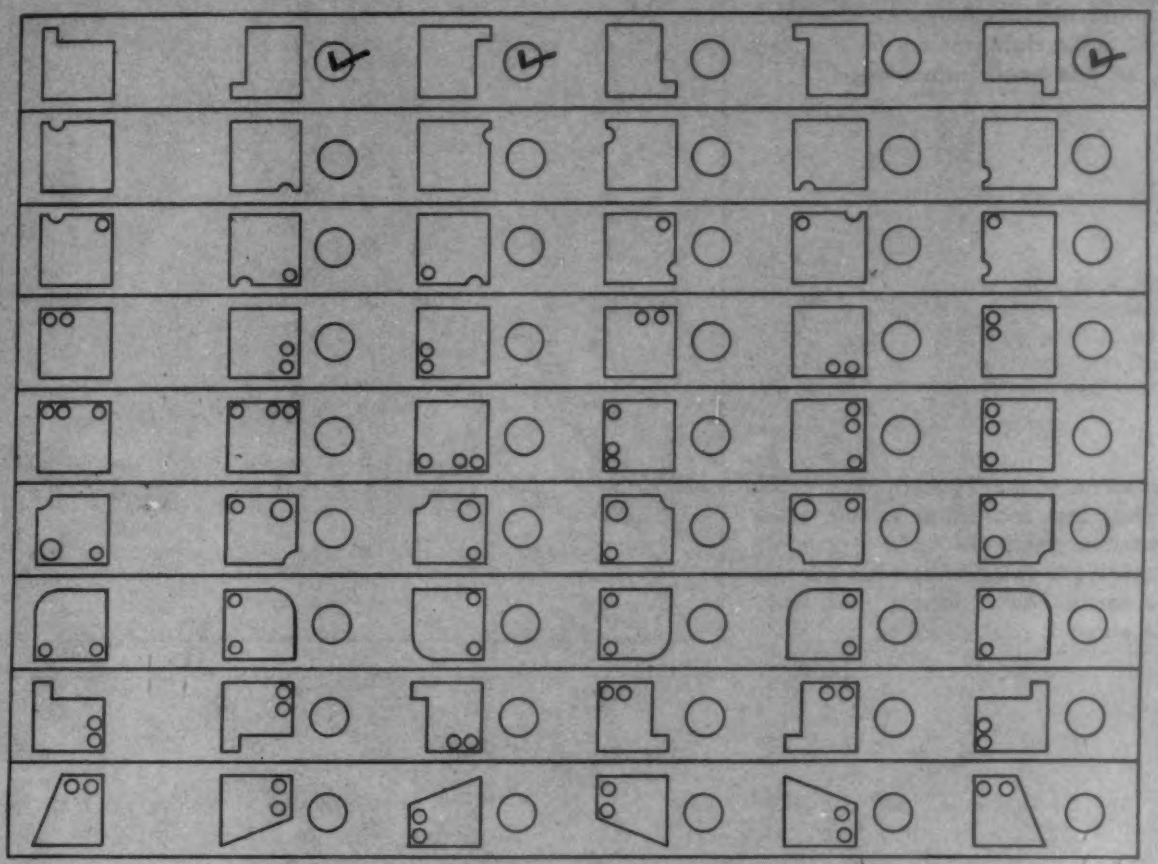
Approximately half of the number facility test is reproduced here. When the applicant reaches this test he finds simple problems in arithmetic have been worked out. But some are right and some are wrong. He is asked to check under each to indicate whether it is correct or incorrect as it stands

III. VOCABULARY

1.	Pile	(Mound	Leisure	Abode	Brisk)
2.	Apart	(Angel	Aside	Suction	Drama)
3.	Mend	(Artless	Refine	Flatter	Repair)
4.	Adept	(Blank	Outcast	Adroit	Billet)
5.	Accord	(Award	Remote	Abhor	Courtesy)
6.	Cumbersome	(Bisect	Clumsy	Eventide	Flash)
7.	Dreary	(Haste	Dismal	Sprung	Villain)
8.	Supple	(Haunt	Comply	Pliable	Repine)
9.	Nurture	(Invest	Muzzle	Develop	Course)
10.	Stint	(Blemish	Abound	Lair	Limit)
11.	Flurry	(Temple	Fluster	Mature	Devil)
12.	Latent	(Dormant	Brusque	Alkali	Receipt)
13.	Impede	(Ordinate	Fetter	Recess	Repute)
14.	Robust	(Abolish	Flatter	Album	Vigorous)
15.	Option	(Exclude	Election	Spite	Carve)
16.	Avenge	(Defiance	Reamer	Vindicate	Carton)
17.	Menace	(Portent	Malady	Spirited	Shovel)
18.	Emanate	(Mediation	Narrow	Originate	Monkey)
19.	Balmy	(Vulgar	Aromatic	Rent	Savior)
20.	Ferret	(Remodel	Lucky	Squash	Rout)

Vocabulary test — shown here in part — contains 50 sets of words. All the applicant has to do is underscore one word in each set which has the same meaning as the first word. The word "mound" is the right word in the first set, of course, so has been underlined here to show how the test is completed

IV. VISUALIZING



Above, six cards on each of 20 lines (only 9 lines shown). First card in each line is front view of a master card. Other cards in each line are the same, but some have been turned around, others turned over. Applicant checks circle for each card not turned over

V. MEMORY

Underscore the correct number for each object listed below. Underscore only one number for each object. The first object is correctly marked.

OBJECT	NUMBER				
Glass	37	<u>17</u>	21	29	77
Nail	10	38	65	18	36
Cow	89	44	11	39	75
Sun	23	12	70	43	63
Paper	18	25	65	91	13
Pencil	15	45	34	24	58
Man	78	14	83	73	47
Lake	22	37	16	92	72

Right, first of three memory tests. On instruction sheet each of eight objects is given a number — sun, 63; pencil, 34; nail, 18; lake, 92; glass, 17; etc. Applicant has to memorize number for each object. When he turns page, he finds same objects, but in different order. He then underscores correct number for each. Other memory tests are similar, but longer and harder

CONTINUED ON NEXT PAGE

Right, applicant finds 25 series of numbers, of which 10 series are shown. Object is to find the rule of progression and underscore the number in the answers that should be substituted for the "X." Here, 12 is the right answer for the first series, so has been underscored

VI. INDUCTION

SERIES						ANSWERS				
2	4	6	8	10	X	6	4	10	12	14
5	6	7	8	9	X	7	8	9	10	11
2	4	7	9	12	X	10	12	14	16	18
12	10	8	6	4	X	1	2	3	4	5
20	18	23	21	26	X	22	23	24	25	26
18	15	14	11	10	X	8	9	10	11	7
8	12	16	20	24	X	22	24	26	28	30
12	14	10	12	8	X	12	16	10	8	20
35	30	25	20	15	X	5	10	15	20	25
22	23	20	21	18	X	17	18	19	20	21

Below, some of the 24 arithmetic problems that test reasoning. After each problem the applicant finds 5 possible answers. He is to underline the answer that is correct, as $2 for the first, $2.10 for the second, and so on

VII. REASONING

If you have $12 and pay three bills of $2.00, $1.50, and $6.50 how much will you have left?
$1.00 $1.50 $2.00 $2.50 $3.00

How much will 3½ bushels of oats cost at 60¢ per bushel?
$1.80 $2.00 $2.20 $1.90 $2.10

If 5 men can cut 2 cords of wood in 2 hours, how many cords will 10 men cut in 4 hours?
4 6 8 10 12

If a bar of steel weighs 8 pounds, how many bars can be loaded on a truck of 2000 pounds capacity?
100 200 250 300 500

How much will you have to pay for 4—3-cent stamps, 2—2-cent stamps and 5—1-cent postcards?
17¢ 21¢ 23¢ 30¢ 18¢

If each man can lift 85 pounds, how many men will be needed to lift a steel plate weighing 510 pounds?
9 11 6 7 5

If you earn $24 per week and pay $6 for board and room and send $10 home, how much will you have left?
$12 $10 $8 $18 $16

How much will 1½ dozen lemons cost if they sell 3 for 10¢?
45¢ 60¢ 75¢ 50¢ 30¢

If there are 8 divisions to the inch how many divisions are there in 7½ inches?
50 60 70 45 62

If a field is 123 yards long, how many feet long is the field?
260 330 369 630 329

If a box is 1'x2'x3', how many cubic feet will it hold?
4 5 6 9 12

If a bar of steel weighs 4.6 pounds per foot, how much will 17 feet weigh?
68 78.2 112 81.6 36.3

If water weighs 8⅓ pounds per gallon, how much will 18 gallons weigh?
216 184 79 145.7 150

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Car-Sharing Plan Conserves Cars, Tires, and Gas

M. L. KEYSER, Transportation Coordinator, American Car & Foundry Company, Berwick, Pa.

ANTICIPATING transportation difficulties for its employees, the Berwick Plant of the American Car & Foundry Company on June 1, 1942, set up an office to deal with these problems. Through public notices the management pledged itself to a policy of car, tire, and gasoline conservation as a vital contribution to the war effort. Plant employees and all other patriotic Americans were urged to do likewise. Notices were posted throughout the shops informing employees of the location of the Transportation Office and urging them to seek its aid in forming car-sharing clubs. Enlarged photostatic copies of an official road map were posted throughout the shops. All routes covered by buses running to and from the plant were traced in red ink. Beside them were posted the time schedules and rates of the bus lines. Those who could utilize the bus service were urged to do so.

To get a complete picture of the riding habits and transportation needs of the employees a questionnaire was submitted to them. A compilation and analysis of the returns revealed that:

9,145 workers were employed
2,583 walked to work
394 used bicycles
6,168 used their own automobile, another's automobile, bus, motorcycle, or some combination of

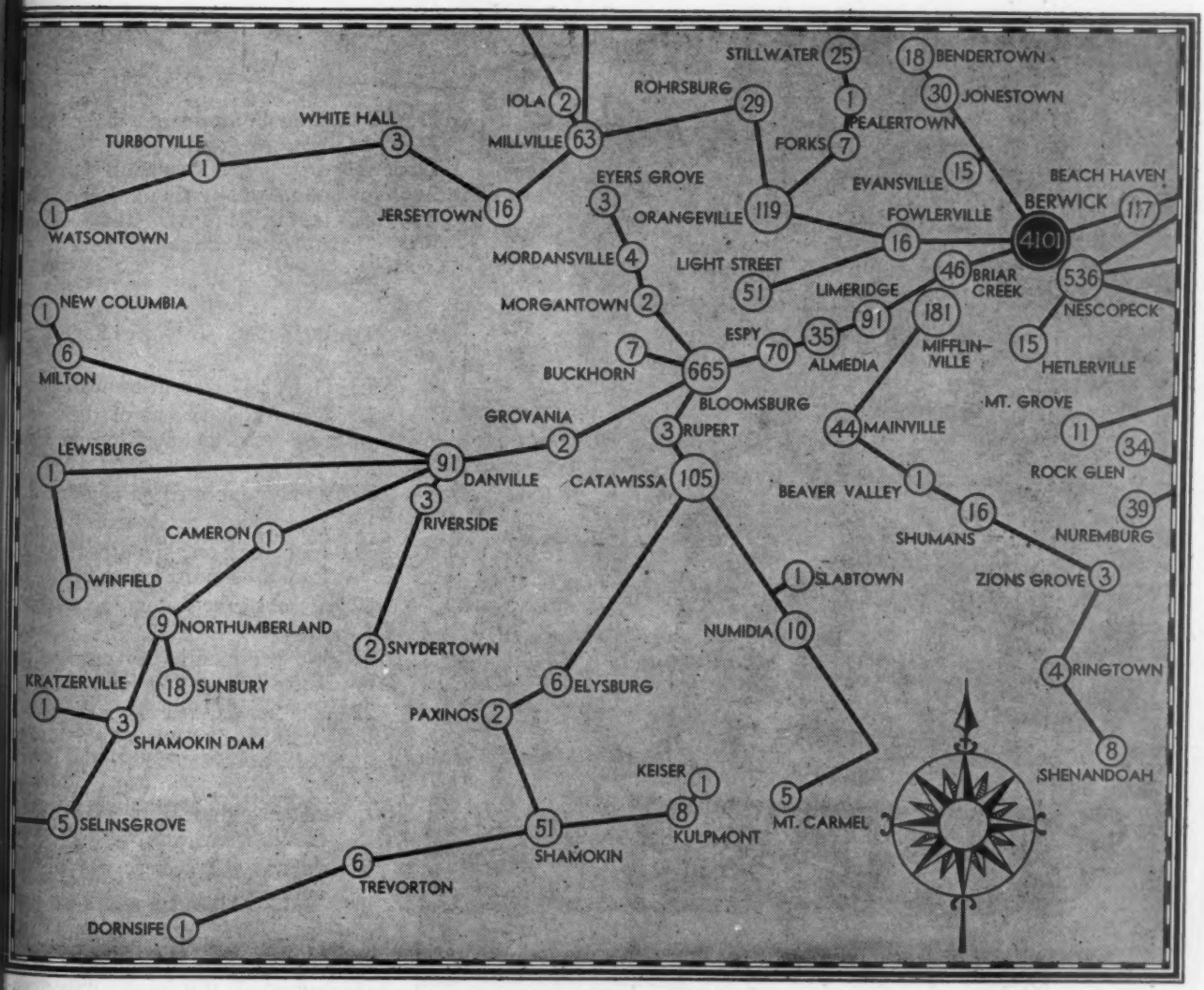
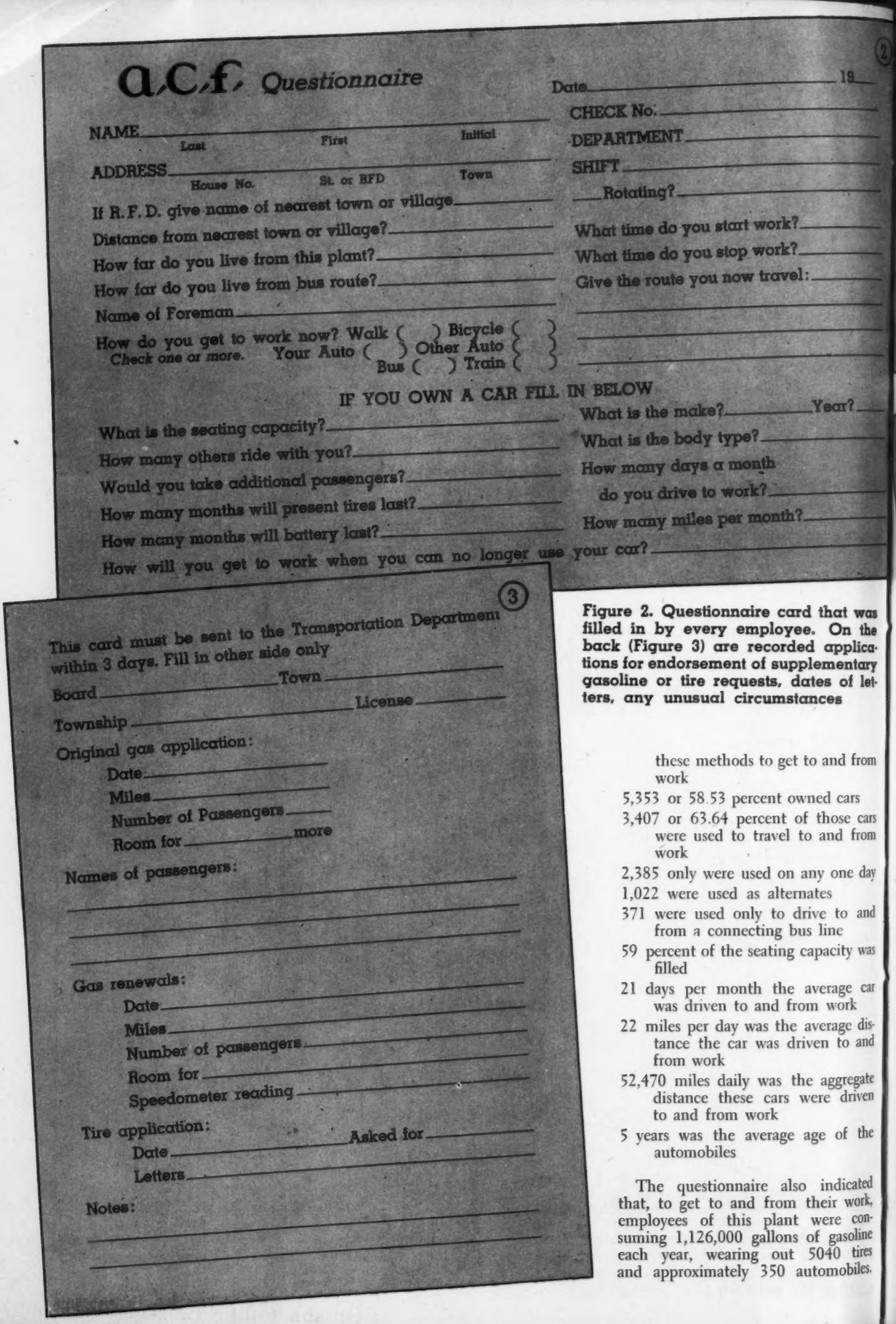


Figure 1. South-west corner of map that shows where ACF workers live. Numbers in circles indicate how many live in each place. It was found that all combined drove 52,470 miles every day

Omaha Public Library



a.c.f. Questionnaire

(2)

Date _____ 19__

NAME _____ (Last / First / Initial)

CHECK No. _____

DEPARTMENT _____

ADDRESS _____ (House No. / St. or RFD / Town)

SHIFT _____

Rotating? _____

If R.F.D. give name of nearest town or village _____

Distance from nearest town or village? _____

How far do you live from this plant? _____

How far do you live from bus route? _____

Name of Foreman _____

What time do you start work? _____

What time do you stop work? _____

Give the route you now travel: _____

How do you get to work now? Walk ( ) Bicycle ( )
Check one or more. Your Auto ( ) Other Auto ( )
Bus ( ) Train ( )

IF YOU OWN A CAR FILL IN BELOW

What is the seating capacity? _____

How many others ride with you? _____

Would you take additional passengers? _____

How many months will present tires last? _____

How many months will battery last? _____

What is the make? _____ Year? ____

What is the body type? _____

How many days a month do you drive to work? _____

How many miles per month? _____

How will you get to work when you can no longer use your car? _____

(3)

This card must be sent to the Transportation Department within 3 days. Fill in other side only

Board _____ Town _____

Township _____ License _____

Original gas application:

Date _____

Miles _____

Number of Passengers _____

Room for _____ more

Names of passengers:

_____

_____

_____

Gas renewals:

Date _____

Miles _____

Number of passengers _____

Room for _____

Speedometer reading _____

Tire application:

Date _____ Asked for _____

Letters _____

Notes:

_____

_____

Figure 2. Questionnaire card that was filled in by every employee. On the back (Figure 3) are recorded applications for endorsement of supplementary gasoline or tire requests, dates of letters, any unusual circumstances

these methods to get to and from work

5,353 or 58.53 percent owned cars

3,407 or 63.64 percent of those cars were used to travel to and from work

2,385 only were used on any one day

1,022 were used as alternates

371 were used only to drive to and from a connecting bus line

59 percent of the seating capacity was filled

21 days per month the average car was driven to and from work

22 miles per day was the average distance the car was driven to and from work

52,470 miles daily was the aggregate distance these cars were driven to and from work

5 years was the average age of the automobiles

The questionnaire also indicated that, to get to and from their work, employees of this plant were consuming 1,126,000 gallons of gasoline each year, wearing out 5040 tires and approximately 350 automobiles.

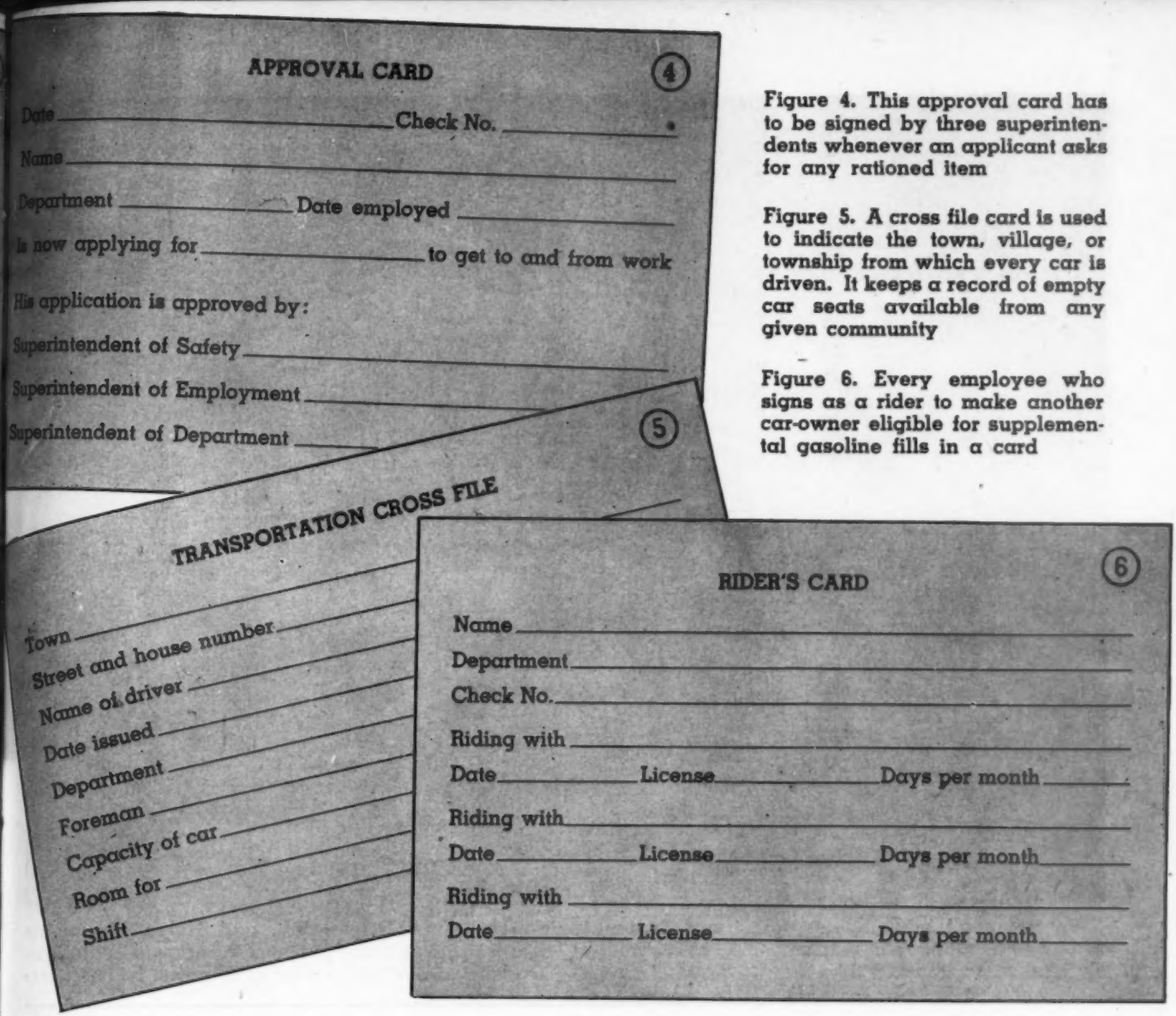


Figure 4. This approval card has to be signed by three superintendents whenever an applicant asks for any rationed item

Figure 5. A cross file card is used to indicate the town, village, or township from which every car is driven. It keeps a record of empty car seats available from any given community

Figure 6. Every employee who signs as a rider to make another car-owner eligible for supplemental gasoline fills in a card

To "keep 'em rolling!" was the main job of the Transportation Office.

For the convenience of key employees, the Transportation Office, cooperating with the local war price and rationing board, issued 526 basic gasoline ration books from July 9 to 11 inclusive. During the 19-day period from July 13 to 31, 1108 employees were assisted in filing applications for supplemental gasoline. Each applicant was required to meet OPA requirements for eligibility, form a car-sharing club, and secure the approval of the superintendent of his department, before his application could be given final endorsement by the transportation coordinator. An analysis of the records of this approved group revealed that car-sharing clubs had been formed on the following basis: 1 six-car club, 9 five-car clubs, 12 four-car clubs, 36 three-car clubs, 86 two-car clubs, and 729 one-car clubs. Of the seating capacity of the cars used by this approved group 75.5 percent was filled. This compared favorably with the 59 percent revealed by the questionnaire.

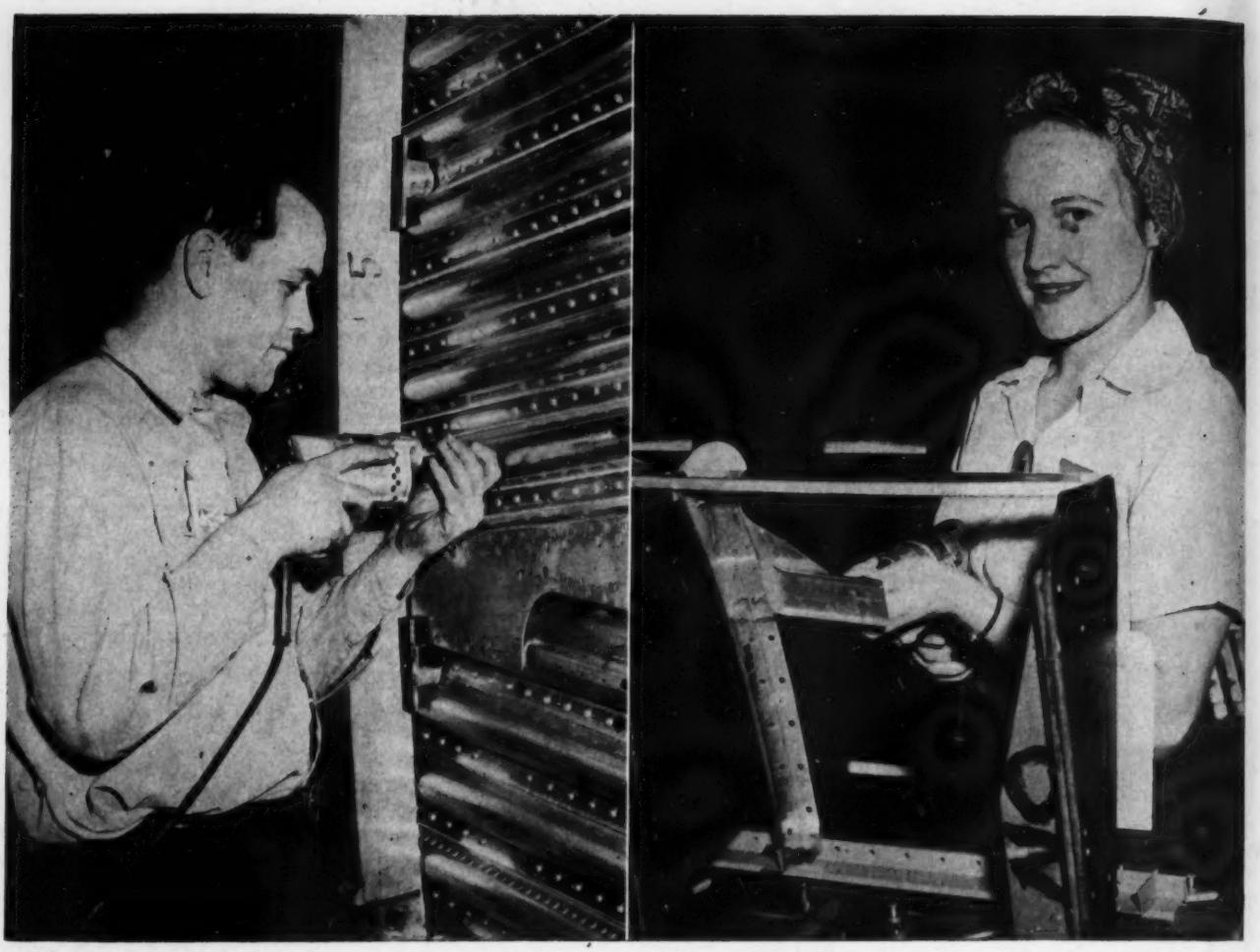
Employees of the plant were found to be living under the jurisdiction of 16 different war price and rationing boards. Maps (Figure 1) were made showing the location and distribution of plant employees. The maps were forwarded to all rationing boards concerned, with other material explaining plant employee transportation problems and the purpose and methods of the transportation department. The department placed itself at service of the boards and pledged itself to the fullest cooperation in the interests of conservation. In return, the boards' cooperation was requested in the interest of full war production. The relations thus established were most friendly and satisfactory.

A filing system was established which contained the following features: Questionnaire card (Figure 2) answered by every employee. When and if he applies for an endorsement for supplemental gasoline or tires, the necessary records are placed on the reverse side of the card (Figure 3). Here, too, are kept records of the dates of all letters written on his behalf. The space for notes is used to record violations, irregularities, or unusual circumstances which may develop. An approval card (Figure 4) is to be signed as indicated whenever an applicant appears for any rationed item.

A cross file card (Figure 5) is used to indicate the town, village, or township from which every car is driven. The chief purpose of this card is to record the empty car seats available to future applicants from any given region. A correspondence file is maintained also.

A rider's card (Figure 6) is filled in for every employee who signs as a rider to make another car-owner eligible for supplemental gasoline. Space is provided on the card to re-

(*Continued on page 201*)



"We just can't take time to talk," say deaf-mute workers at Goodyear Aircraft—they have to put down their tools when they want to hold a conversation. Zura Hayes, left, and Helen Marguerite Evans, right, without previous experience in airplane work, are riveting wings and parts for bombers

How Handicapped Workers Fill Manpower Needs

INCREASED EMPLOYMENT of handicapped persons, both men and women, is one of industry's best answers to the current shortage of manpower. Just because a man cannot hear or see or speak, it does not follow that he cannot do a day's work. Put him on the right job, say companies with experience, and he will do as well as, and sometimes better than, the man who has no physical handicaps.

The problem boils right down to finding the kind of work these handicapped people can do—and training them to do it. The variety of jobs for which they are suited, and which they are already handling with unusual capacity, is truly amazing. For proof see the appended testimony of eight companies asked by FACTORY to contribute their experiences. That testimony indicates that employers who have not yet tapped this fruitful source of manpower will do themselves and the war effort a favor by surveying the possibilities.

The Bullard Company

Frank Dedrick, director of safety, and Fred Somers, personnel director, The Bullard Company, Bridgeport, Conn., agree that physical handicaps are no insurmountable barrier to employment on that company's tool production line. Men without arms or legs, or with atrophied muscles, can readily be employed. Only for the blind has it so far been impossible to find work in the manufacture of turret lathes.

Two men, each with only one leg, are employed in the milling department. Artificial legs overcome any handicap—in fact, the need for a new leg was among the reasons given by one of the men when he applied for the job. Both were trained for

Twining and tinning wire ends at RCA Victor, Grace Valentine, left, does more than hold her own in production, even though she is quite blind. Right, Russell Thrasher, who has to wear a leg brace as a result of infantile paralysis, works on tractor transmissions at Caterpillar Tractor Company

the Bullard organization at the State Trade School in Bridgeport.

Deafness is no handicap to employment, in Bullard experience. The company has a lip-reader among its inspectors, another in the foundry, and a score or more on production lines.

One man with one eye is employed as a timekeeper, nearly a dozen others similarly afflicted are operating lathes, gear-cutting machines, grinders, millers, and other production equipment. There is only one restriction for men with one eye—safety goggles must be worn from the moment they enter the plant until they leave, with absolutely no exception.

RCA Victor

In contrast to the experience of The Bullard Company, RCA Manufacturing Company, Camden, N. J., finds work for sightless people to do. Blind eyes are recompensed by talented hands, and talented hands are needed for precision jobs. Five blind persons are working on important assignments at RCA Victor. All of them are more than making good. One is in the record-finishing department. Another is assembling parts of dials. A blind girl is engaged in twisting and retinning wire leads. Another girl splits mica in an operation where any mica less than one-thousandth of an inch thick is scrapped.

Jobs are not given to the individual blind, but to the New Jersey Commission for the Blind, whose placement officer, Arthur L. Voorhees, is himself blind. The commission recommends that this or that operation in a plant be given to someone who is capable of doing it, though blind. The blind person is then trained on the job, supervised by the commission, so that if he produces less than is expected the commission can bring in someone else.

Says R. C. Maslin, assistant personnel director: "When I was first approached, I was skeptical about the practicability of employing sightless workers. With the many hazards involved in mass production, it becomes a problem to safeguard employees with normal eyesight. However, we decided to try one blind worker, only after Voorhees spent days in the factory trying out various established jobs. RCA is more than pleased with the results obtained through blind workers, and expects to place others in the near future."

Brown-Brockmeyer

On one assembly line at the Brown-Brockmeyer Company, Dayton, 11 of the 15 people are deaf mutes. They are making grinder units, which are built up on roller conveyors and pushed from one operator to the next. According to Steffen S. Brown, works manager, their physical handicap has not reduced the production

At Lockheed, Charles Kime, blinded in an accident, works in the spot welding department, is guided by his Seeing Eye dog. Here he is inserting and setting "one-end Rivnuts" on a P-38

Stockchaser Arthur Russell at Caterpillar Tractor is happy to be employed in a 100 percent war production plant. He lost his right hand in an automobile accident, now uses an artificial one, and gets along very well

of these deaf mutes. They are somewhat slower to start, but production on these machines has been increased. These people do not change jobs, according to Brown, and turnover is practically nil. Once they have been taught a job, they are good workers and seldom absent.

General Motors

Typical of companies that have developed a definite policy in handling persons with various kinds of physical disabilities is General Motors Corporation, Detroit. It keeps them busy on jobs they can handle, where the work will not tax them unduly or endanger their safety. Periodic examinations help to keep them as fit as their handicaps allow, and prevent their being placed where the work is too strenuous.

Rehabilitated cases of tuberculosis need special care. At General Motors these cases are X-rayed every three months to be sure they are progressing satisfactorily. Men with heart defects are under constant supervision of the plant's medical department. They report for examination as often as the doctor considers necessary.

In one GM plant two wards of a government institute for the blind were hired for specialized employment in protected areas. Foremen report that they are conscientious workers and can handle their jobs satisfactorily.

Thus General Motors finds that the handicapped can replace the able-bodied, and do a wholly satisfactory job, if the jobs are carefully chosen to suit their capabilities.

Goodyear Tire

More than a hundred mutes are in vital war production jobs at the Goodyear Tire & Rubber Company, Akron. Nearly 33 percent of them are in self-sealing gasoline tank departments where a knowledge of compounding and application of rubber is imperative. Other departments that find them useful workers include fabric inspection, tire, balloon assembly, tire inspection, and gas mask. The average service record of the mutes is 20 years. The oldest, in point of service, has been with Goodyear since

Harvey Carson is believed to be one of the few skilled blind auto mechanics in the country. Here he demonstrates his skill at the Ford Rouge plant, where he is now employed

At the Rochester Products Division of General Motors, Bernard Cameron, who lost his arm at Pearl Harbor, is one of the inspectors. Here he confers with an Army officer who also is an inspector at the plant

1912. The ten women in this group are described by company officials as "thoroughly competent," "definite assets to the company," "we'd like to have dozens more just as good."

Vultee Aircraft

A wide variety of handicaps can be overcome by proper training and proper job assignment, according to officials of the Nashville Division of Vultee Aircraft, Inc. They point with pride to a deaf-from-birth worker in the engineering department, and wish they had "more like him." In the fuselage-monocoque department a little man, 4 feet 4 inches, is making himself so useful that two little women are now being trained to do similar work. A one-handed worker is reported as doing "exceptionally good work" as a stock chaser. Blindness in one eye is proving no handicap to a clerk in the materials control department, and a girl with one leg is doing a "fine job" in the timekeeping department.

On the basis of the records of performance set by these workers, Vultee emphasizes that handicapped workers who have specific facilities and training can well fit into an airplane plant's employment set-up.

Ford Motor Company

About 10 percent of the men employed in the River Rouge plant of the Ford Motor Company are physically handicapped in some manner.

The sightless number 687. Some have lost their eyes; some can only distinguish between light and darkness; a few can see motion if it occurs between them and light. Only two lost their vision because of accidents in the Ford Plant.

There are 66 who are deaf and dumb; 42 are partially incapacitated because of infantile paralysis; 112 suffer from epilepsy.

Eighty have but one arm; 1 has no arms; 223 have one arm crippled; 12 have had both arms amputated; 91 have had one leg cut off; 36 have one leg badly crippled; 31 have lost use of some parts of their bodies because of spine fractures; 96 have

(*Continued on page 204*)

Using the Case Method in Supervisory Training

R. J. GREENLY and E. B. MAPEL, Industrial Relations Division, Carnegie-Illinois Steel Corporation, Pittsburgh

THE MOST SATISFACTORY procedure for developing the ability of supervisors to carry out their employee relations functions equitably and consistently is to provide them with a better opportunity to exchange views and experiences. Special conferences dealing with employee relations problems allow them to find out what other supervisors are thinking and doing in employee relations; permit them to discover new attitudes, new approaches, and new methods for solving their own particular problems.

An employee relations discussion leader often finds it difficult, however, to bring out points he has in mind, or points the conferees believe to be crucial, because there is nothing definite to which the conference can be related. The current problems within the department are usually avoided because of the personalities involved. As a result, the discussion frequently degenerates into meaningless or trite generalities. Nevertheless, by using "problem cases" drawn from actual experience in other plants, the leader can provide a common ground on which supervisors can compare their varied attitudes and opinions, and on which they can work out practical, consistent, and satisfactory solutions. Such "cases" have been used in the Carnegie-Illinois supervisory training program to supplement the usual methods, and have proved to be a welcome variant in the program routine as well as an effective method of instruction.

One of the cases used in the Carnegie-Illinois program appears on the facing page. (Other cases will be selected for publication in subsequent issues.—Ed.)

Each case consists of a brief but complete statement of an employee relations problem followed by a series of statements indicating some ideas or actions which may apply to the situation. The cases have been selected for their general interest and for their clear presentation of a common problem. Most of them are chosen to illustrate how several general principles are woven into one case, for that is the way employee relations problems actually occur. Our purpose has been to demonstrate the need for considering all angles to a problem, for weighing conflicting principles of employee relations, and for choosing between immediate and long-term benefits.

These cases are intended as a stimulus to discussion. There is no intent to give rules or principles for solving employee relations problems. There is no intent to suggest "right" or "wrong" answers to the quiz questions. The only purpose is to state a common problem in a way that helps the supervisors to think out their own collective answers.

In use, one case is discussed at each two-hour conference. The conferees study the day's case and mark their responses to the quiz items before the discussion opens, so that the responses may be quickly tabulated before the major points for discussion are selected. Provision is made for this by having each case printed with detachable answers which can be marked and handed in without revealing the name of the conferee. The "group opinion" resulting from this tabulation allows each member of the group to compare his opinion with majority opinion, and indicates the points that merit discussion. Wherever the tabulation indicates disagreement, the opposing points of view are presented and analyzed. No attempt is made to secure complete agreement on all questions, since many of them do not permit unqualified acceptance or rejection. Instead, there is a vigorous attempt on the part of the leader to assure that all viewpoints are adequately presented to stand or fall on their merits as far as the points are beyond recognized company policy.

Trial has shown that the use of a specific case, without embarrassing or personal significance to the group, is an effective stimulus to discussion, especially when the quiz feature is added. Most supervisors find the cases to be interesting, and most of them feel that the case study method is a helpful approach.

The value of the case-study method does not end with the supervisor. Management, too, is learning something from the conferences. By analyses of the responses made to quiz items, it is possible to compare the opinion of one group of supervisors with the opinion of other groups in the same or different locations. It is also possible to compare the judgments of groups at different levels of supervision. Thus the case-study conferences form an important link in the two-way communications within an organization. They permit management to keep a responsible finger on the pulse of supervisory attitude and opinions.

WHAT WOULD YOU DO IN A CASE LIKE THIS?

First of a series of problems prepared for use in supervisor-training classes

CASE NUMBER 1

SUPERVISORY PROBLEMS

Joe Blake is a tractor operator in No. 8 shipping department. He has worked for the company six months and had a clean record until a week ago. He came to this job highly recommended by a neighboring company for which he had worked. A week ago his tractor became overheated because of a dry radiator and had to be sent to the shop for repairs. Both shipping and repair departments were behind schedule and the delay resulting from the absence of this tractor caused considerable confusion and loss.

One of the tractor rules states that each operator shall inspect his machine thoroughly before work is begun, and again before turning the machine over to the next operator. Joe Blake, like all other operators in the department, omits the first inspection, but makes a careful inspection at the end of the turn so that the following man will find the machine ready to go.

After investigating, the foreman reported the incident as an act of carelessness and a clear violation of the plant rules, and consequently penalized Joe by giving him a one-week layoff. Joe reminded the foreman that it was a well-known and tolerated practice to omit the first inspection, and brought in the previous operator who insisted that he had filled the radiator just before the breakdown. Being a new man, Joe did not feel it wise to argue further and accepted the penalty with good grace.

During the following week the rumor arose and was substantiated that the tractor breakdown was caused by a group of six packagers who, as a joke, drained the radiator of Joe's tractor while he was away in the lavatory before the start of his turn. These details and the names of the men involved were known to nearly everyone in the department.

CASE NUMBER 1

Plant _____

Dept. _____

The following statements apply to this situation. Study each one carefully. If you agree, put a circle around the "T" following the statement. If you do NOT agree, circle the "F". If you are in doubt, circle the "??"

1. The six packagers should be given penalties equal to Joe Blake's.	T	?	?	F
2. The foreman should apologize to Joe and void the rule violation report.	T	?	?	F
3. The foreman should let the report stand, since responsibility for the continuous operation of the tractor is Joe's, regardless of the action of others.	T	?	?	F
4. Joe should be given enough overtime work to make up for his loss of income.	T	?	?	F
5. The foreman should be verbally reprimanded for allowing the inspection rule to be violated openly.	T	?	?	F
6. The foreman should not change his action unless Joe takes up the matter with his grievance committee and threatens to demand redress.	T	?	?	F
7. The departmental supervisor should take advantage of the situation by holding a meeting with the men to point out the waste and loss caused by a "practical joke" and a violation of plant rules.	T	?	?	F
8. Joe should be transferred to another department to cover up the foreman's action.	T	?	?	F
9. The company should refuse to recognize the act of the packagers since delayed recognition of that aspect of the case might be cited at a later date as an example of management's arbitrary actions carried out without proper investigation.	T	?	?	F
10. All the tractor operators in the department should be penalized for violation of the inspection rule.	T	?	?	F
11. The foreman should protect his men by explaining to his supervisor that he (the foreman) has tolerated such limited inspection practices.	T	?	?	F
12. The foreman should conceal the matter from his supervisor, if possible, since admission of his tolerance of a rule violation would serve only to increase friction and undermine his authority.	T	?	?	F
13. The company should not permit the foreman and superintendent to admit that an error of hasty misjudgment was made, since such an admission would lower employee morale.	T	?	?	F
14. A foreman should be certain of his information and of all the facts before he takes any action against an employee.	T	?	?	F

NEXT MONTH: Bill is foreman in a machine shop. For ten years his crew had been known among the employees as a good one . . . SEE CASE NUMBER 2—APRIL

Better Workplace—So More Output, Less Fatigue

E. J. FITZGERALD, General Manager, Joseph Black & Sons Company, York, Pa.

How A WORKER moves is as important as how much he moves. Observance of this fundamental work rule suggested simple changes in the sit-down job of examining army socks. As a result, the output of our inspectors increased almost 60 percent.

The job itself was simple. Conditions seemed good. But the girls' backs and shoulders ached unaccountably. Their trouble, we found in a study of the causes, was not in the actual doing of the work. It was in *maintaining themselves* while doing it. It was a great surprise to us to find that conditions that seemed good, conditions that demanded no unnecessary moves, could still be very wasteful of human energy—that weariness could come not only from too many or too long moves in work production, but also from an undue demand for energy in body maintenance.

A New Chair

Our first move was to give one of the girls a sturdy cloth-seat suspension chair. It brought her body into a position quite new for sitting—a position not unlike that of a cross-country runner. It steadied the whole of her spine and adjusted itself to the continuous flow of her work motion.

Then, without any equipment except the new chair in which the operator sat without tension, we tested out the height, direction, and inclination at which she could most naturally and easily go through the motions of sock inspection.

Next, we took her fixture, a swiveled sock arm, from the table where it had been breast high, and mounted it from the floor at elbow height. With it there, the worker did not have to keep her arms raised and so tire herself by merely holding them in working position.

Also, the sock arm was no longer straight in front of her and level, but on a diagonal slant from tip to swivel. With it there, along the normal path of her hands, her arms could swing easily, back and forth, up and down, pendulum fashion, while she pulled the socks on and off.

BEFORE. Conditions seemed good, but arms, backs, and shoulders ached at the end of the day. Fatigue was excessive. Breast-high, straight sock arm was not well designed. Merely holding arms at that height was tiring, and resulting motions, unnatural and shuttle-like, were bad. A hard, uncomfortable chair did not prevent soldiering, did induce fatigue. Note the improvised footrest—no rest here

With the main activity properly implemented, we again tested for natural and easy motion—this time for the secondary activities. When the operator, by unhampered experimenting, had replaced all wearying shuttle motions with easy, flowing motions, we knew we had the pattern for the form and placement of the auxiliary set-up—how and where to put "supply," "ready," "good," "imperfect," and "finish" bundles of socks. "Ready" and "good" bundles had to be at hand along the short oval path her hands traveled during the main activity—"ready" on a low table just

AFTER. Low chair with suspension seat supports spine naturally, throws body forward into comfortable working position. Sock arm is now mounted on the floor at elbow height. Slant from tip to swivel enables operator to strip sock on and off with a natural, pendulum-like motion. "Occasional" operations that require forward and sideward movements provide needed relaxation. Production was increased 58 percent

No "broken back" with this chair. It gives support where support is needed, adjusts itself to continuous flow of work motions. Canvas suspension seat is soft enough for comfort, is cool in summer. Footrest is carefully designed for normal foot position

below the tip of the sock arm, "good" in her lap. But "supply," "imperfect," and "finish" bundles belonged to occasional operations in second-line activities. They went into racks at arm's length—right, front, and left. Their placement automatically forced the operator to swoop forward or sideward. That occasional but much needed stretch exercised generally unused muscles and relaxed the ones that had been so active in the short, quick, repetitive motions that form the main rhythm of "examination."

When the experimental set-up was completed we turned it over to the inspector to try out, free of interference. We hoped it would relieve her weariness and improve her morale—and, because of that easing up, perhaps produce an incidental increase in output.

The first week she reported a great improvement in her back and shoulders. First her output rose. Then it soared. By the second month, when her new norm was well established, the revised way of sitting and moving was rolling up a weekly average for her, and us, 58 percent above her original pace.

How It Breaks Down

Judging from the improvement in other operations where only one of the physical factors was changed, the 58 percent increase divides into:

25 percent contributed by the strong position of the spine.

20 percent contributed by the eased position of the shoulders.

13 percent contributed by the curved motion paths of the hands.

We have now rearranged the workplaces for our other inspectors and have provided them with the new chairs. They are as enthusiastic as the girl with whom we did the experimenting. Like her, they find the "new order" has reduced fatigue. Like her, they have increased their output close to 60 percent.

Keeping Track of Labor Costs

Costs are still one of our best yardsticks of operating efficiency—and should be used as such even in the war plants where output comes first. Costs are *not* "out for the duration." Control is as important as ever

D. A. DEARLE, Manager, Plastics Division, North & Judd Manufacturing Company, New Britain, Conn.

THOUSANDS OF FACTORIES that used to operate on a 40-hour week are now running at twice or three times their former capacity. Night shifts have been added, employees' wages raised, overtime wages allowed, bonuses given, and innumerable other adjustments hastily granted in order to satisfy the demand for goods. To complicate production problems further, these exigencies have been accompanied by the loss of experienced men who have been taken by the government, and an increasing dearth of raw materials.

Even under ordinary conditions, the switch from normal activity to maximum production involves an increase in product cost as well as certain losses in running efficiency. Given sufficient time, management is usually able to cope with these variations in number of man-hours and soon makes the necessary adjustments in selling prices to compensate for the change-over.

The present situation is different, however. This time the acceleration has been accompanied by unprecedented demands from all sides, and executives have had to close their eyes, temporarily at least, to increases in manufacturing costs in an attempt to attain maximum production at the earliest possible moment. Outside pressure has been exceptionally heavy and time too short to investigate the true differential in costs of producing the items as compared with former figures.

There are, however, ways in which management can diagnose the entire labor-cost situation from week to week or month to month without the expenditure of too much vital time. By the initiation of a comparatively simple system the trend of manufacturing activity can be easily followed, and cost analysis soon becomes a weekly routine.

In the first place, we know that under present conditions the number of man-hours is increasing and that the payroll will appear each week with a much higher figure. To offset this added expense, however, an increased amount of goods will be produced, even though the ratio will not necessarily be direct.

It becomes evident that statistics regarding man-hours and the corresponding articles manufactured are of vast importance. Consequently, a summation of the number of employees engaged in direct labor should first be tabulated. From this figure can be ascertained the actual number of employee hours utilized during the working week. Second, the amount of goods manufactured should be listed and the different products segregated to obtain the number of pieces made. Finally, the number of pieces produced should be multiplied by the selling price of each part to obtain the lowest possible production value. This procedure will give the total worth of production.

As an example, let us assume that a plant, manufacturing three distinct lines of articles, makes 30,000 units of *A*, 120,000 pieces of *B*, and 66,000 parts of *C* during a certain week of operation. The minimum sale prices of these units might be as follows:

$A = \$40$ per thousand
$B = \$30$ per thousand
$C = \$85$ per thousand

Then the total production value would be \$10,410. This figure is obtained by multiplying:

$30 \times 40 = \$1200$
$120 \times 30 = \$3600$
$66 \times 85 = \$5610$

Let us now hypothecate further by stating that the total number of employees included in the originating, finishing, and inspecting departments is 24 on a day shift of 8 hours, and 12 on a night shift of 8 hours. The plant operates on a 40-hour week; the entire personnel engaged in direct labor amounts to 36. As each operator is paid for a 40-hour week, the total number of hours amounts to 1440. To ascertain the total payroll expenditure for direct labor the wage rates will now have to be applied.

If these wage rates were always uniform, it would be an easy calculation, but there are, of course, variations throughout the entire department. Hence let us further assume that the piecework wages for the 36

(*Continued on page 210*)

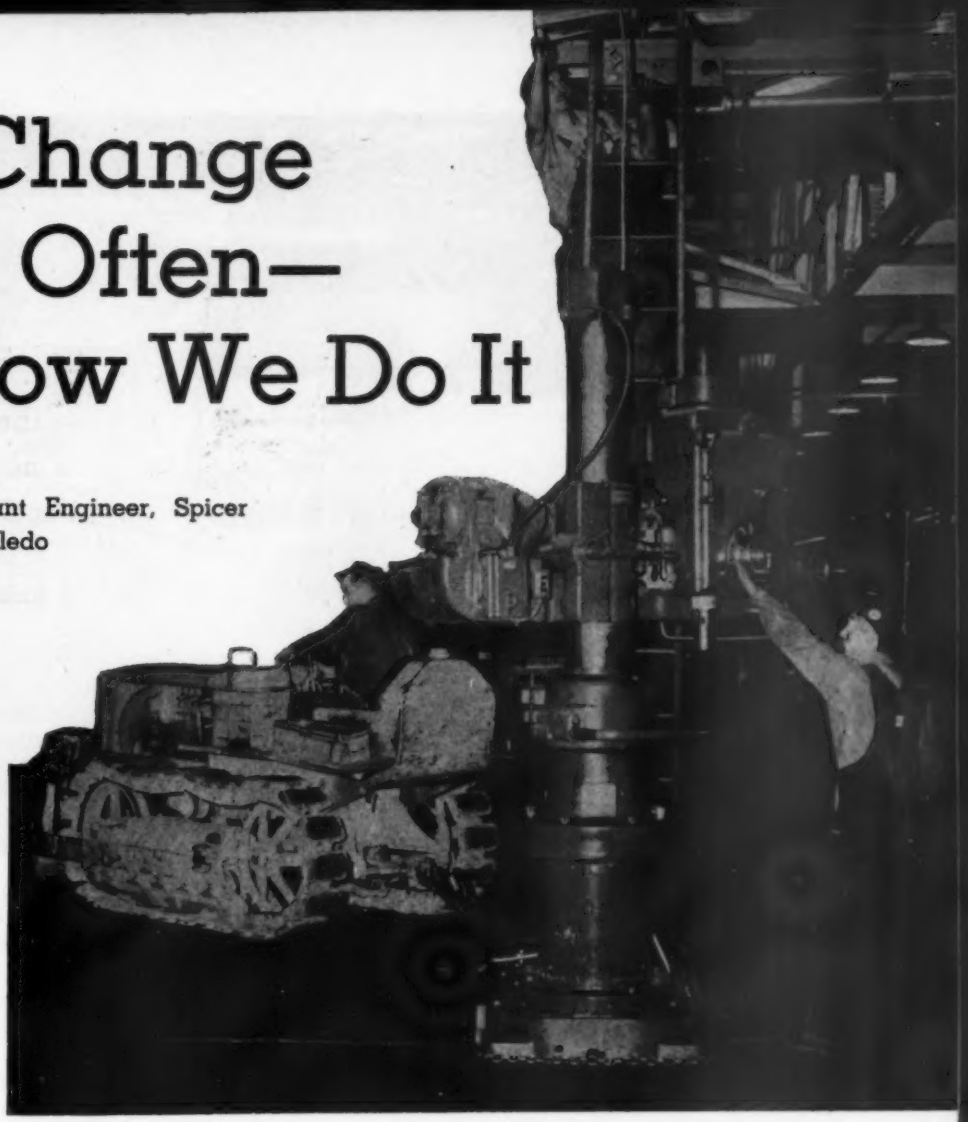
Table of Unit Costs per Labor Dollar

	1	2	3	4	5	6	
Week Ending	Production Value	No. of Empl.	Empl. Hours	Val. per Empl. Hour	Average Wage Rate	Unit Cost	Remarks
8/23/42	\$10,410	36	1440	\$7.23	\$0.5533	\$0.0765	Changing dies
8/30/42	13,280	36	1414	9.39	.5533	.0589	High production value
9/ 5/42	11,800	34	1360	8.68	.5875	.0677	2 operators out
9/12/42	12,668	36	1410	8.98	.5875	.0654	Labor Day holiday
9/20/42	14,600	40	1600	9.12	.5750	.0630	4 new men
9/26/42	15,820	40	1600	9.89	.5750	.0581	High production value
10/3/42	16,200	40	1600	10.13	.5750	.0568	Little down time

Column 1 is obtained by multiplying total units by minimum sales price of each unit
Column 2 is obtained from time cards
Column 3 is figured from time cards
Column 4 is obtained by dividing column 1 by column 3
Column 5 is the average of all rates per hour
Column 6 is obtained by dividing column 5 by column 4

Have to Change Layouts Often— Here's How We Do It

MIKE KALLAHER, Plant Engineer, Spicer Manufacturing Company, Toledo



Shifting a machine to its new location. Electrician goes with the movers to disconnect plug in the old place, connect it at the new

IN MANY LINES of manufacturing the necessity for frequent changes in layout may be of no great significance, but in a jobbing business such as ours —manufacture of truck and bus parts —it is an ever-present problem. On the average, 20 machines have to be moved each week because of minor changes in the many lines in the plant. Every four or five months, a major move is made in all lines due to engineering changes in the product, such as a change in gear ratios, finishes, or the proportion of the various products turned out.

We cannot make a layout and expect it to remain constant for any length of time. Many kinds and types of axles and transmissions are made for truck and bus production, and design changes come at any time. Obviously, a rapid and a reasonably economical way of changing the layout must be devised.

Machinery in the plant is arranged in lines, but each line may make many types and sizes of the same part or apparatus. The universal joint line, for example, produces over 100 types and sizes. The equipment needed is lined up in sequential form, but one joint may move from machine 1 to 5, to 6, to 10, and so on; a second joint may start with machine 2 and then proceed to 3, 4, 7 in the sequence of operations. With so many engineering changes, the plant engineering department must have a quick way of making the required shifts in machine layout.

One-Story Building

The type of building is a help. It is a one-story building, with a monitor roof in which the glass in each monitor is equal to approximately half the span, therefore no limitation is placed on the location of machines by natural light requirements. An asphalt-impregnated woodblock floor on a concrete base permits sliding and pushing equipment from place to place without damage either to the equipment or to the floor.

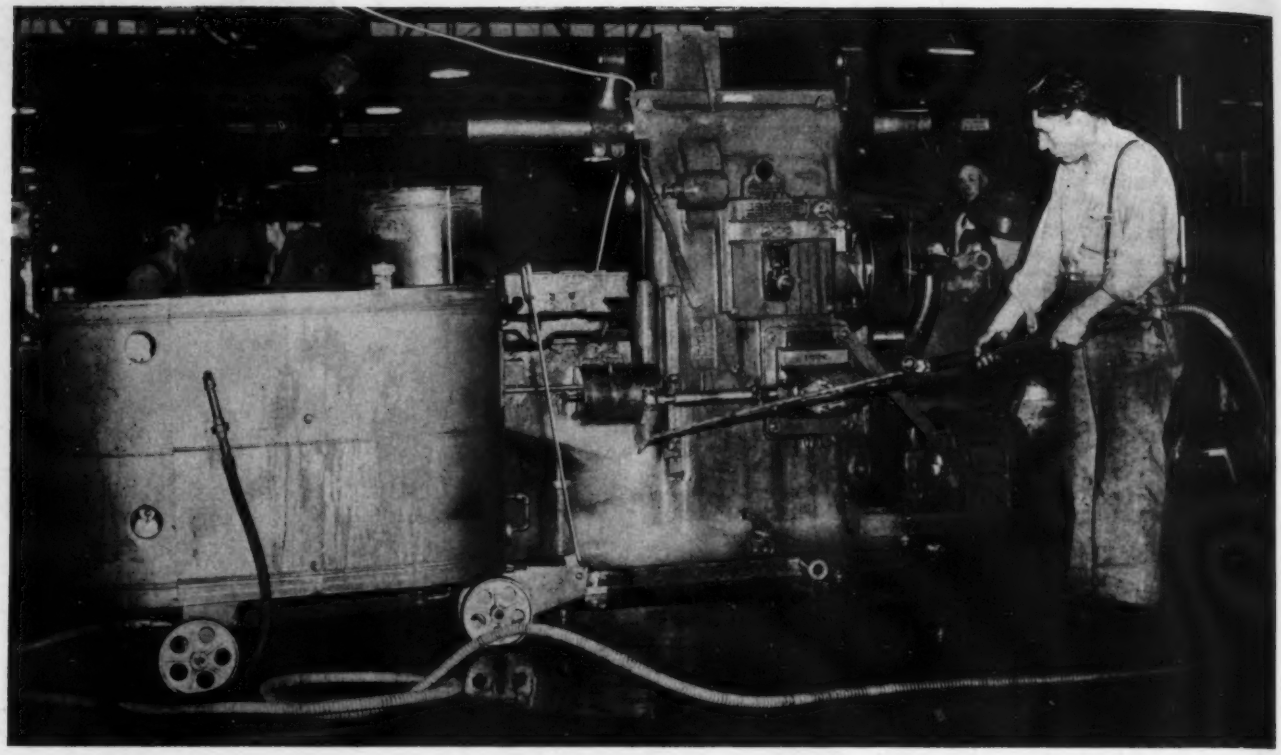
Practically all equipment is driven by individual motors attached to each machine, for in no other way can we accommodate a constantly shifting environment. Power duct is used, of course, and is suspended at regular intervals from the roof structure at right angles to the monitors.

The ability to plug in at any point along the duct is a well-known advantage. To secure the degree of flexibility we require, however, the leads down to the machines from junction boxes on the duct are not carried in pipe but in flexible cable. The shop does not present quite the orderly symmetrical appearance afforded by pipe-inclosed drop cords, but then we do not require hours of pipefitting time when we want to change the location of a machine.

An equally advantageous factor is that machines are not bolted to the floor. The question may be raised as to machine creep, but this has never caused any trouble. The net result of the factors just mentioned is that a tractor and operator and a millwright can move a machine in half an hour; an electrician goes along to pull the machine plug from one junction box and to push it into another at the new machine location.

Special Lighting

Individual lights are provided for most machines, because the shape of the part or the character of the machine usually requires illumination in addition to the general system. But the application to each machine must be streamlined to fit into our requirements for a quick change. A 440/110-volt 100-watt stepdown transformer is especially designed for nipple connection to the 440-volt controller at the machine. When the machine is moved, all necessary electrical equip-



Whenever a department is rearranged, each machine in it is cleaned and repainted. It takes two man-hours to clean, one-half hour to spray with quick-drying lacquer. Three hours from the time the plug is pulled at the old location the machine, clean and fresh, can be in operation at its new site

ment, which includes power and light, moves at the same time—pull the plug, move, and plug in at the new location. On many machines the light circuit is wired so that when the motor stops the light goes off. This cuts down light bills. It is not done on operations where inspection is required while the machine is idle. The light transformer and wiring represent an investment of some $6 per machine, but when a machine is "here today and gone tomorrow" a lot of expense in rewiring is saved.

Machines Kept Clean

It cannot be claimed that any new wrinkle in organization aids in speeding up equipment moves. The plant engineering department is responsible for the motorization of equipment and for locating the equipment. It is not responsible, however, for machine repair. A policy that has been in force for some time results in cleanliness of equipment and hence, in the long run less maintenance work. Whenever a department is rearranged, which happens rather frequently, each machine is cleaned and repainted. It takes two man-hours, on the average, to clean each machine with kerosene and half an hour to spray it with a coat of quick-drying lacquer. Three hours from the time the plug is pulled at the old location, the machine may be operating at the new one, completely cleaned and with a new coat of paint. Cleaning and painting are done by the plant janitor force week ends or on overtime, depending upon the urgency of production.

Methods of making quick moves have been evolved through experience in moving. Some machines are pulled along the floor by a chain attached to the legs; others, due to shape or size, are slid onto a flat steel plate ¼ inch thick and some 3 feet wide by 6 feet long. An angle member, with an eyebolt connection for the tractor, is welded to the end of this sheet. For especially heavy machines, 10 to 15 tons, slide rails, ½ inch thick and 3 inches wide, curled at the ends to prevent slippage of the machine during the moving process, are used. The machines are jacked up and the rails slid under them.

To get a machine from one spot to another, a tractor with rubber pads on the endless treads is used to pull it over the floor by one of the hitches just described. The machine is pulled to a spot adjacent to the desired location and the tractor operator, by maneuvering which only experience will teach, inches it to the proper spot on the floor.

The tractor, or the machine itself, depending upon the hitch, is first unhooked from the drag plate and then used to butt the machine into place. To the front of the tractor is welded, by connections to the tractor frame, a heavy-gage steel apron 30 inches high, which reaches to within 6 inches of the floor. Sometimes the apron is used directly in the pushing. At other times, depending upon the shape of the machine, a heavy wooden block is placed on the floor against the base of the machine. This block is thick enough to span the 6-in. space between the apron on the tractor and the floor. By one of these two methods the machine is put into position quickly, and with no strain or heavy lifting required of the millwrights who accompany the tractor operator.

Quick Changes

These many aids to quick moving of equipment have been evolved through necessity; they all contribute to keeping equipment functioning in a rapidly changing environment. It was mentioned that 20 machines, on the average, are moved each week. Recently it was necessary to move a department of 50 machines, many of them heavy gearcutters. This was done in one day by using two tractors with their operators, plus a millwright and an electrician for each tractor.

Significant Labor Developments

Period surveyed: January 10 to February 10

TREND INDICATORS

President Orders 48-Hour Week

THE PRESIDENT established by Executive Order a minimum 48-hour work week with overtime for all hours in excess of 40, and directed all departments and agencies of the government to insure compliance on the part of their contractors.

War Manpower Commissioner McNutt followed this order by an announcement that it be applied immediately to all types of employment in 32 critical labor areas whose minimum week is less than 48 hours, and that these establishments were to cease recruiting labor at once.

To enforce this policy effectively, WLB and OPA were ordered not to approve any increase contrary to the stabilization policy without consulting OES.

Unit Application for Wage Increase

A single application may now be made for wage adjustment in several plants, provided the application is filed with the Regional Director of the Wage-Hour Division in the region where the employer maintains his principal place of business.

Double-Time Restriction Tightened

Heretofore, double-time payment was restricted to the seventh day of consecutive work; payment of double wages on Sunday was eliminated regardless of the number of days worked in the week. Under a recent ruling of the Secretary of Labor (reversing a former ruling), double-time payment is further restricted to those cases in which work is performed on seven consecutive days within any one work week; a work week may start with any calendar day of the week, provided the same calendar day is continually used.

For example, one shift may be permitted to work up to 12 consecutive days, one day off and six work days constituting the first week, and six work days and one day off constituting the second work week. Under such an arrangement no double time would be allowed.

Wage Increase Ordered

The Wage-Hour Administrator ordered that the minimum wage be raised to 10 cents for workers in grain products, handkerchief manufacturing, seamless hosiery, converted paper products, and candy and related products.

WMC Delegates Authority

War Manpower Commission began its "hiring controls" by delegating authority to regional directors, to require that all hiring for specific industries be handled through the U. S. Employment Service or other authorized agency. Employees are required to take war jobs where their skill would be most effectively utilized, and essential activities are to have first call on all available workers in the order of their urgency. All employees engaged in essential activities are permitted to transfer their jobs only to other essential activities, and then only on the basis of a statement of availability.

Contract Modified to Conform With Belo Doctrine

A Federal District Court authorized the reformation of an employment contract affecting the employees' right to recover back overtime compensation where there was a mutual mistake of law and fact. In the particular case, the Court found that at the time the contract was entered into both parties intended total payments were to cover overtime under the Act (The Belo Doctrine*). (Adams vs. Union Dime Savings Bank.)

Application of Public Contracts Act

The Walsh-Healey Act covers operations necessary to the production of materials furnished under a government contract, the activities of time study men, tool designers, and estimators, and stenographers transcribing material from such employees.

To comply with the Act, government and commercial work should be segregated to insure the minimum pay required for actual work on a government contract. Homeworkers are barred, since the Act requires that a factory or establishment produce on the premises the materials required under the contract.

* See FACTORY, Feb., 1943, page 96.

Blacklist Penalty Continued

In refusing to stay a blacklist penalty against a firm, the Secretary of Labor rejected a plea that the employees would suffer from lack of employment; shortage of manpower would absorb the employees, and the greater issue of public policy interested in the preservation of standards required by the law barred any leniency.

Secretary of Labor May Enforce Subpoenas

The Supreme Court ruled that the Secretary of Labor can enforce a subpoena of the records of a government contractor without first proving that the employees whose records are sought are covered by the Walsh-Healey (Public Contracts) Act. This decision vastly strengthens the powers of the Secretary of Labor in determining whether or not a violation has been committed. (Endicott Johnson Corporation vs. Perkins.)

Employees' Release Discarded

A release signed by employees under agreement with their employer for a flat sum irrespective of hours worked is deemed worthless. In the particular case, the employees claimed to have worked in some instances as many as 80 hours a week, and gave the release of a payment of $10. (Fielder vs. Potter.)

Held Under the Act

The exemption which attaches to workers engaged in first processing does not apply to manufacturing operations in which substantial quantities of other products are used, or in which products subject to first processing are further processed. It does not apply if during any part of the work week an employee performs duties which do not fall within its scope; nor does it apply to an industry—it is limited to specific processes. (Walling vs. Bridgeman-Russel.)

Employees of a flourmill not employed within the area of production (mixing with locally grown soft spring wheat, approximately 15 percent hard wheat obtained some 300 miles distant). (Walling vs. Yeakley.)

Employees who produce machinery for use by other manufacturers within the state who manufacture goods for interstate commerce.

Employees who produce completed

(Continued on page 212)

MANAGEMENT SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary management accomplishments. Accepted articles will be paid for

Glasses for Accident-Prone Workers

HAROLD M. SCHERR, Manager of Production, The Juvenile Manufacturing Company, San Antonio, Texas

Recently a supervisor brought us a report stating that 90 percent of our stitching-room accidents were caused by operators' piercing their fingers with the needles of their machines. The supervisor was convinced that these minor but aggravating injuries could be attributed to employee carelessness. He substantiated his conviction with further statistics indicating that the majority of girls injured in this manner were chronic producers of rejected work.

In an effort to verify the origin of these accidents we interviewed the last 20 girls injured in this manner. We learned that only one of the group had been properly fitted for glasses, and only one other had ever had a thorough eye examination. As an experiment we made arrangements with a competent ophthalmologist to examine the girls' eyes and prescribe glasses when necessary. Our doctor found that 12 of the 18 he examined required glasses for the close and tedious work required of them.

Increased quality and quantity of production, as well as the reduced number of accidents among the 12 girls that have been given glasses, has been so gratifying that we plan to continue the experiment on a plant-wide basis.

•

Drill Press Safety Rules in Booklet Form

SOURCE — General Electric Company, Schenectady

"If you don't know the safe way, stop to find out. It's a lot easier to do things right than wrong—and a whole lot safer." This is the admonition on the front of a small pamphlet distributed by foremen to drill-press operators at the Schenectady works for safer drill press operation.

Twelve regulations, approved by the safety committee, tell the operators:

Before Starting Drill Press

1. If there are red, green, or yellow tags on the machine, do not move the control handle or switch.

2. Use the method prescribed by your foreman when lifting jig or work to bedplate.

3. Work should be blocked or clamped securely before starting to drill.

4. Remove all drift pins and chuck wrenches before starting spindles.

5. Goggles and safety shoes should be worn to protect against flying chips (eye hazards) and materials falling from bedplates (toe hazards).

6. Drill-press operators should not wear finger rings, loose sleeves, neckties, gloves, or wrist watch. Hair nets, snoods, or caps must be worn so that the hair will not catch in spindles or revolving tools.

7. Use proper feeds and speeds.

8. Before attempting to replace a driving belt, be sure the motor is shut off.

While Press Is in Motion

9. Keep your drill lubricated. If drill should burn, it might break.

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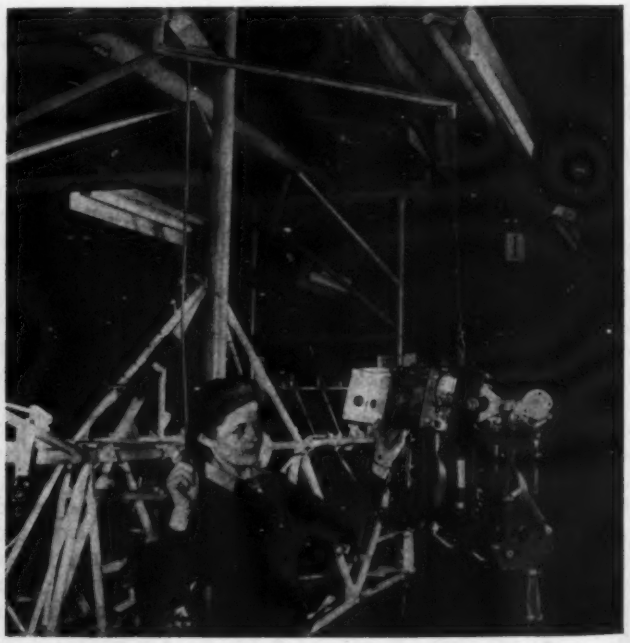

At Vultee Aircraft, Inc., a light tubing assembly which joins a pneumatic rivet gun and bucking bar enables the operator (left) to do work that formerly required two men. Suspended from a traveling counterbalance and operated by a trigger on a gun handle, its use requires little more effort than firing a pistol. The revolving jig gives ready access to both sides of the panel assembly to be lifted. Right, a pivoted crane with counterbalance makes light work of installing assemblies that exceed the 25-lb. lifting limit. The operator does no lifting at all

MAINTENANCE SERVICES

The well-maintained plant is the high-production plant

SELECTION • INSTALLATION • INSPECTION • UPKEEP • ORGANIZATION

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CHANGE OF ADDRESS

McGRAW-HILL PUBLISHING COMPANY
330 West 42nd Street, New York, N. Y.

Director of Circulation:
Change my address on Factory Management and Maintenance

From .....

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To .....

.....

Signed .....

FACTORY MANAGEMENT AND MAINTENANCE

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

MAINTENANCE as the Editors See It

If You Can't Get Men, Consider Women

SHORTAGE OF MANPOWER is going to become worse rather than better. The conclusion has been made plain by Selective Service, the War Manpower Commission, and other agencies.

It seems equally plain that, in the matter of personnel, maintenance faces a problem whose solution will require ingenuity and thought.

For additional manpower, and replacements of men who have gone into the service or taken up other work, maintenance executives will have to seek: (1) men more than 38 years old, the present military age; (2) younger men who are not eligible for military service, because they have physical handicaps of one kind or another, or for other reasons; (3) women.

Obtaining men in the first group presents few, if any, problems that are new. In any event the older men will constitute the backbone of the maintenance force and must be depended on to do the hardest, most hazardous work.

While many maintenance jobs require strong backs and brawny arms, others demand comparatively little physical strength or exertion and may well be handled by handicapped men.

The thought of using women for other than clerical work may be shocking to many hard-bitten maintenance chiefs. Nevertheless, women in industry are daily proving their worth and versatility in countless jobs that are new to them.

Equipment oiling, cleaning, and inspection, simple repair work—these and other maintenance tasks could be handled in many plants largely by women, thereby releasing skilled men for more exacting duties which cannot safely be intrusted to inexperienced help.

Why not canvass the possibilities for using women in maintenance work, just in case?

Water Sprays Are Safe for Electrical Fires

IF WATER IS DIRECTED onto live electrical equipment that has caught fire, the person holding the hose is not necessarily in danger of electrocution. So says a recent bulletin of the Associated Factory Mutual Fire Insurance Companies. But note well the conditions under which the use of water is safe.

It is always best, of course, to shut off the current when fighting electrical fires, regardless of the type of extinguishing equipment used. Furthermore, the bad effects of water on electrical equipment are so well known that its use will automatically be avoided whenever possible.

Situations may easily arise, however, where it is not possible to cut off the power immediately. Also, when fighting fires close to electrical apparatus, the stream from a hose or water-type extinguisher may accidentally be turned on it. A solid stream of water may conduct enough current to be dangerous to the firefighter, but if he stands far enough away for the stream to break up into a spray before it touches the equipment, he will be in little or no danger.

Water from some approved spray nozzles may safely be turned on live electrical equipment in emergencies. Tests have shown that with one approved nozzle no dangerous current was conducted by the spray at a distance of 10 feet, at any water pressure above 20 pounds per square inch, at voltages up to 250,000.

Safe distances for using solid streams of water on live electric equipment depend on the voltage and whether fresh or salt water is used. It appears that when voltage to ground is 1100 volts, 6 feet is the minimum safe distance between the nozzle and the electrical equipment, when fresh water is used. With salt water the minimum safe distance is 25 feet. With 6600 volts to ground, the minimum safe distance, using fresh water, is 19 feet—30 feet if salt water is used.

To repeat, it is always safest to shut off current when fighting fires in or around electrical equipment, but if this cannot be done, or would involve a hazardous delay, water may be used with safety under the conditions described.

Make Copper Go Farther by Keeping Wire Sizes Down

WHEN ANY WIRING is installed these days, it is decidedly in order to determine with unusual care the size of conductors needed. It's always easier, of course, to guess at a size that will do and allow plenty of leeway, for safety. Control wiring is an example. The tendency usually is to play safe and put in plenty of copper. Oversized wires won't heat up, of course, and no one gets into trouble.

When copper is cheap and plentiful about the most that can be said against such a practice is that it increases investment costs needlessly. Tying up more copper than required is then of little moment.

Copper is anything but plentiful today. Every bit available must be worked to the safe limit. That means determining wire sizes closely, instead of guessing at them. The small amount of extra work involved will be richly paid for in a scarce and indispensable metal.

Decentralized Maintenance for Continuous Output

A. T. KUEHNER, Director of Plant Engineering, Douglas Aircraft Company

BETTER UTILIZATION of existing manpower. A cleaner and more efficient plant. Less machine and equipment downtime. Lower maintenance costs. Those are the chief advantages of decentralized maintenance as it is set up today in the headquarters plant of Douglas Aircraft Company.

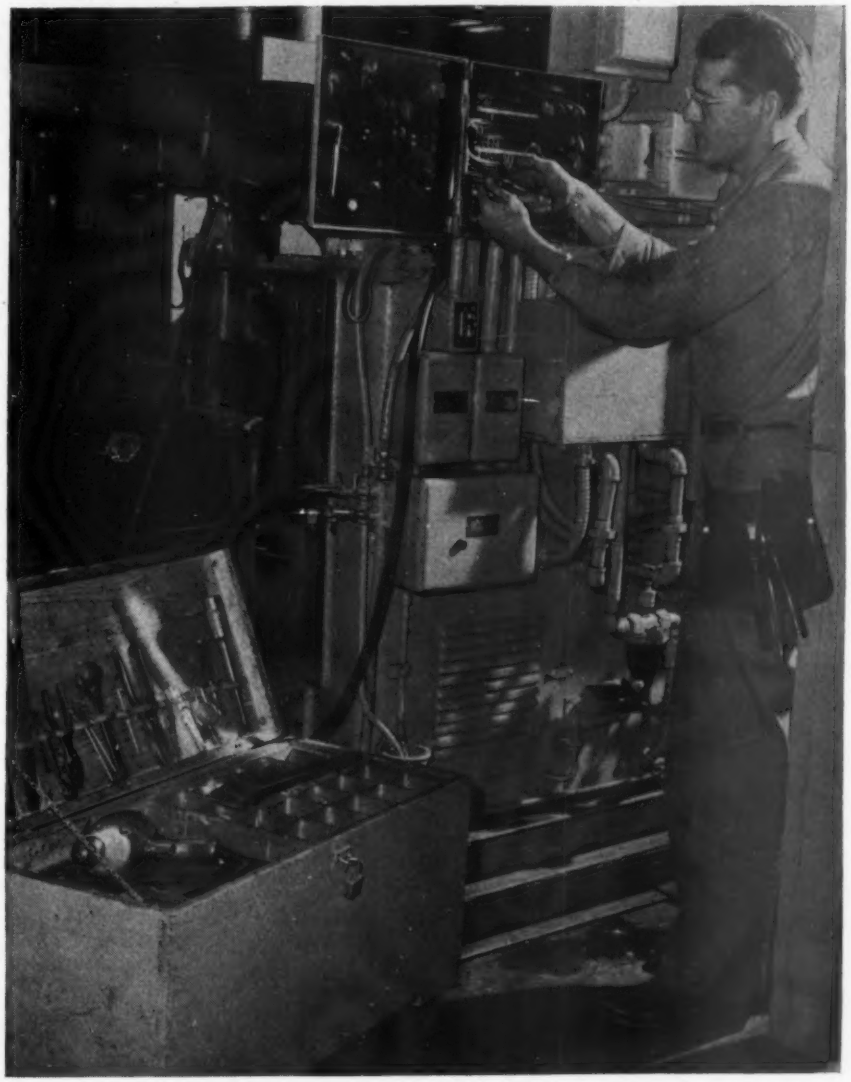
When, a little over three years ago, a huge expansion program was launched this factory began to take on the typical aspects of the aircraft plants of today—that is to say, it was characterized by large expanses of floor space for assembly purposes, and great quantities of small machines and tools of all types for fabrication of aluminum parts. It soon became evident, as the plant spread over new acres, that the maintenance department, which had formerly serviced a small compact unit, was unfitted both physically and organizationally for the greater task with which it was now faced.

★ The well-maintained plant is the high-production plant

Prompt steps were therefore taken to remodel it to meet the requirements of the expanded plant. The past couple of years have seen a steady evolution from the old organization to the decentralized maintenance organization of today.

One of our first steps was to establish a series of "trouble cribs" throughout the plant, thus bringing the maintenance department, at least partially, right into the middle of its actual working area. Each crib has a definite area surrounding it to be serviced, and the size of an area that can be cared for from one crib naturally varies with the amount of machinery and equipment contained in it. Thus the Santa Monica plant has seven electrical cribs, five mechanical, two carpentry, and two plumbing and sheet metal.

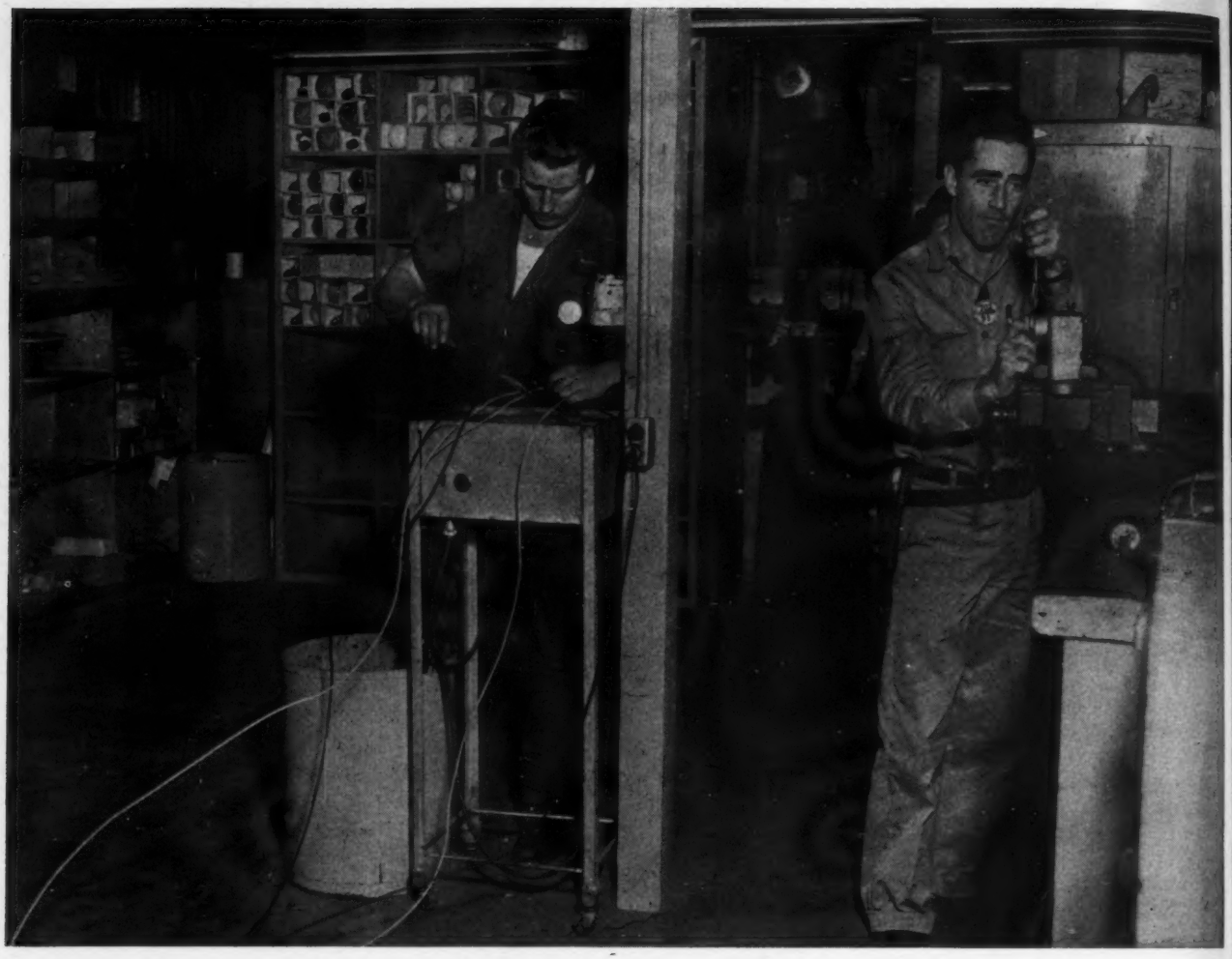
This system has obvious physical advantages over a central maintenance headquarters. First in importance is the great saving in time in answering trouble calls because of the shorter distances to be traversed. This saves time for the maintenance department, but, far more important, it materially reduces the out-of-service time on broken-down machines and equipment.



Maintenance electrician works out of one of Douglas's seven electrical cribs, travels short distance to answer trouble calls, is thus on the job in quick order and better able to reduce out-of-service time

A secondary effect of the rapid service on maintenance calls is the virtual elimination of tinkering with machinery by production personnel. Knowing that their calls will bring prompt response, the men and women operating machines abide by company rules forbidding them to tinker with machinery and call the maintenance man as soon as trouble occurs. As a matter of fact, the operators have come to place such reliance on the maintenance men that they call at the slightest sign of trouble, and thus make it possible to remedy many minor defects before serious trouble can develop.

A further advantage of the decentralized crib system is the decided im-



Trouble cribs are essential part of Douglas plan for decentralizing maintenance; they bring the maintenance department right into the midst of the production fray. Here, one of the electrical cribs

provement in preventive maintenance it makes possible. In selecting sites every effort was made to locate each crib as near as possible to the center of trouble calls in the area it was to serve. This naturally made the men working out of the crib acutely conscious of the faults causing these calls, and it was not long before they began to develop numerous corrective measures to eliminate the causes.

As an example, it was not unusual at one time for equipment in the aluminum spotwelding department to be out of service as much as 5 percent of the time. Today, with a greatly expanded department, machine downtime averages only 10 hours a week, and frequently there are weeks showing no lost hours at all.

Lubrication procedures, too, are far more systematic and satisfactory. Lubrication is performed from each mechanical maintenance crib as a headquarters, and these cribs have been located as near as possible to large concentrations of machinery. Since the oilers became well acquainted with the machines in their own areas, failures due to overlooked oil holes or grease fittings have been reduced to an absolute minimum.

Not the least of the benefits derived from this maintenance zoning system is the sense of responsibility it develops. Realizing that any serious interruption of production in their area because of equipment breakdowns is a direct reflection on their personal efforts, the men do their utmost to keep every machine under their jurisdiction in topnotch operating condition.

Less Upkeep Time

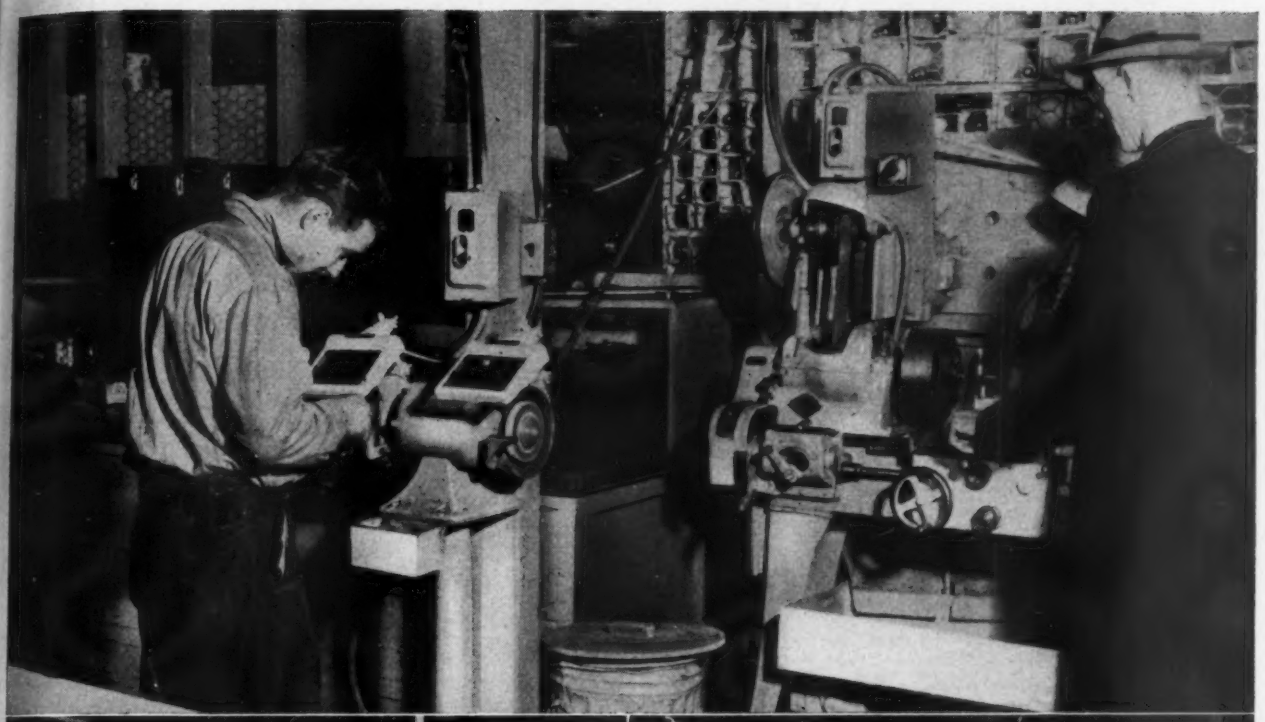
Not only have breakdowns been greatly reduced, but total maintenance time on many machines has also been gradually cut down because permanent remedies have been found for more and more of the common troubles besetting the equipment. This has enabled the cribs to take over many routine maintenance tasks formerly performed in central repair shops.

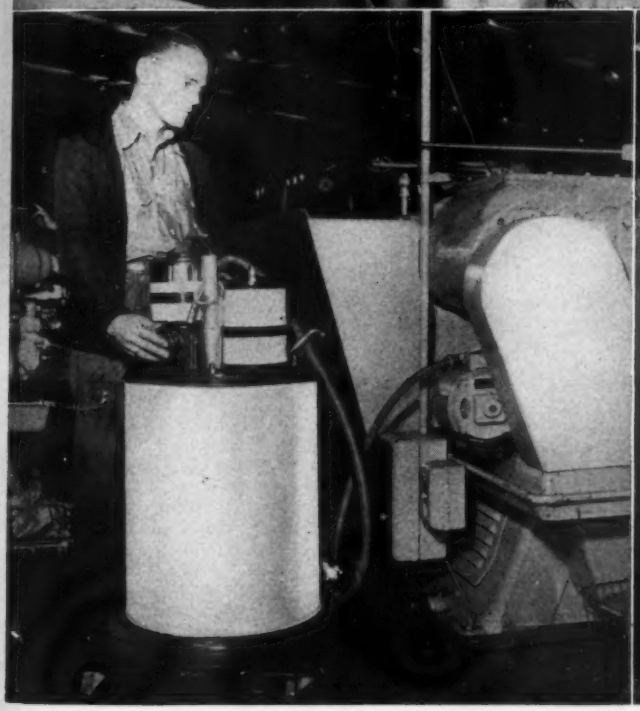
For example, men in the electrical cribs now fill in their time by repairing extension cords, junction boxes, and other portable electrical equipment, while plumbing crib crews keep all air hose and fittings in repair. These odd jobs enable the crib system to be operated at its topmost efficiency and prevent any loss of valuable man-hours of maintenance labor.

When it was decided to adopt the decentralized maintenance scheme because of its obvious physical adaptability to the problem of servicing an aircraft plant, it was at once realized that radical changes in organization would have to be made in order to provide adequate supervision for the widely scattered maintenance units. With the realization that a truly effective organization would finally be achieved only after numerous trial-and-error attempts, a broad program to be used as a guide in these efforts was established. This program had three basic aims:

1. To provide adequate but not superfluous supervision.

2. To establish a system of upgrad-





Top, one of five mechanical cribs which are located as near as possible to large concentrations of machinery. These cribs are headquarters for lubrication specialists (below) who become so familiar with machines in their areas that failures due to overlooked oil holes or grease fittings are few

ing which would enable each man progressively to better his position in accordance with his ability.

3. To allow the heads of the maintenance organization ample time for thinking, planning, and experimenting by keeping the mass of routine details out of their hands.

The most obvious danger in connection with the decentralized maintenance organization was that it would result in topheavy supervisory costs. This problem has been solved by making full utilization of the "working leadman." The activities of each crib in the plant are directed by a leadman who has full responsibility for maintenance of his area. However, he is relieved of personnel, planning, and materials problems by a "district leader," who has several leadmen reporting to him. This enables each leadman to direct the activities in his area and do his full share of the maintenance work.

Duties of the district leaders are to handle personnel problems, plan work, and see that each leadman is supplied with the necessary materials and tools. Each district leader thus handles a

great many of the details that would otherwise fall on the leadmen, with a consequent decrease in their working efficiency—or on the departmental supervisors who would then not have time to handle long-range maintenance and organization problems.

For Final Decisions

Each supervisor of the shop maintenance departments—electrical, mechanical, plumbing and sheet metal, carpentry and labor, plant cleaning and janitor service—reports to a general supervisor of maintenance. On this general supervisor rests the final handling of all shop problems arising in the maintenance division. It is his duty to coordinate the activities of the five departments; to see that each is operating efficiently and rendering the desired grade of service to production departments; and to be the final arbiter of all shop personnel problems.

The general supervisor thus acts as a buffer to keep problems solely concerned with shop operations from reaching the plant engineer, to whom he reports. This leaves the latter free to devote his time to design of new equipment (which is done by the maintenance engineering department under the direct supervision of the assistant plant engineer), construction work, plant rearrangement, utility problems, and kindred matters.

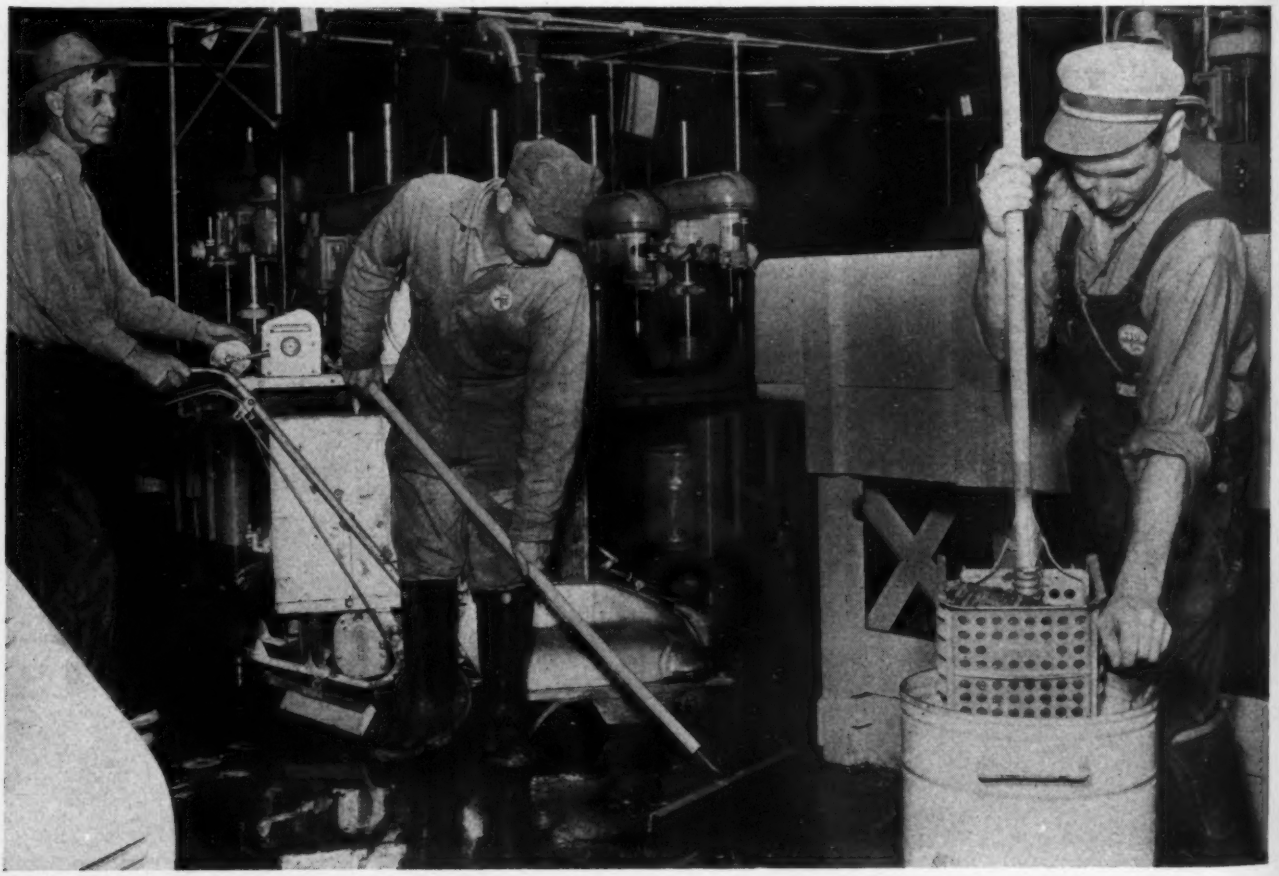
An outstanding example of the merits of this organizational framework, which takes the burden of details from the department heads, is seen in the handling of plant cleaning and janitor service. For instance, the job of scrubbing the machine shop used to require a crew of 12 men working 10 hours, and caused considerable inconvenience to productive operations, but now 4 men do it in 6 hours with no bother to production.

This is the result of a planned operation which is begun when the supervisor of the machine shop is notified in advance that the shop is to be scrubbed. He sees that all loose equipment and production parts are picked up. Next the sweepers remove all loose dirt, and they are immediately followed by the scrubbers. The leadman of this crew operates the scrubbing machine, two men handle the water, and a fourth does odd jobs, the whole crew performing rapidly and efficiently as a well-trained team. This planning pays dividends not only in time saved but also in results achieved.

A similar routine has been developed for general cleaning work. First a train of trailers pulled by a tractor comes through each department and picks up the rubbish barrels into which production employees have sorted the various types of waste. These containers are steam cleaned from once a week to once a month, depending on type of usage, and are repainted and stenciled with the proper identification each time.

Keeping Clean

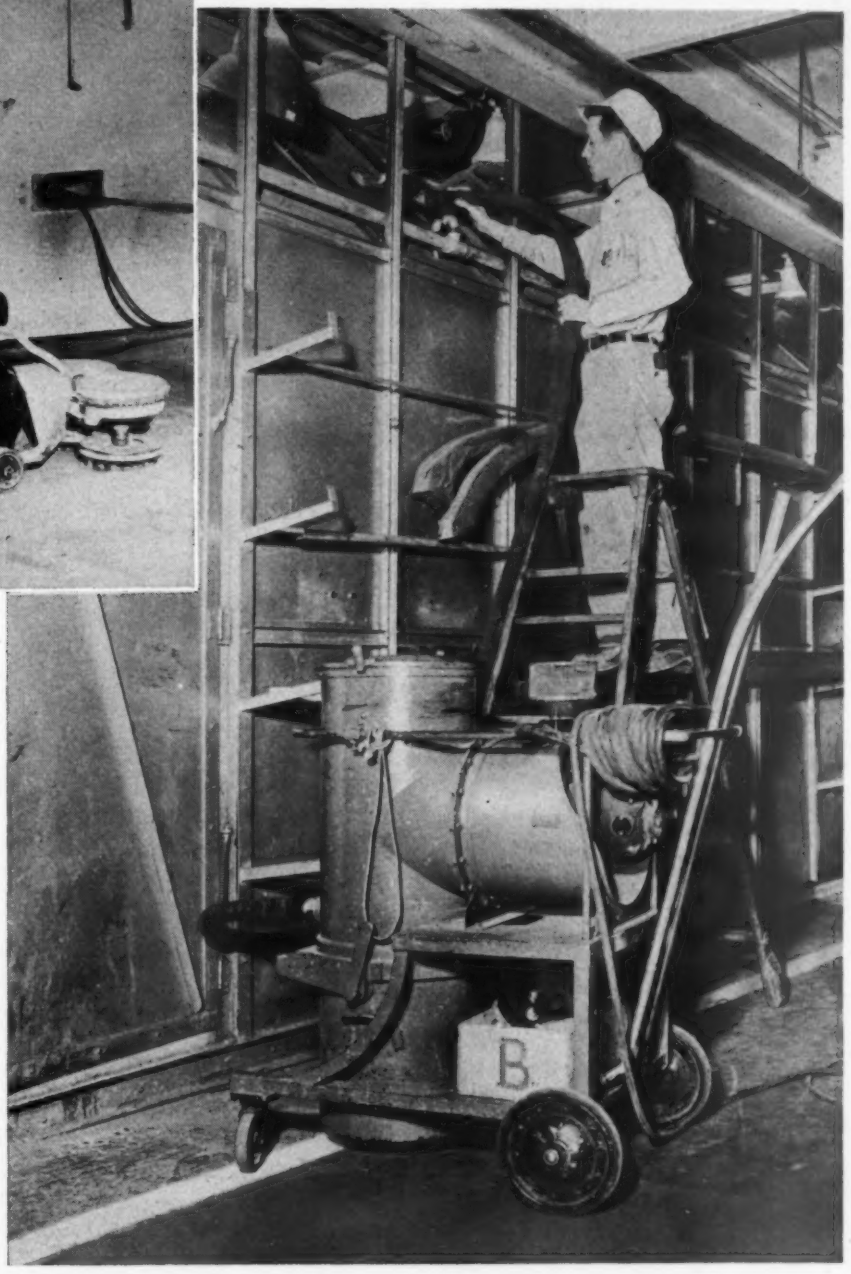
Following the pick-up crew are the sweepers and—if it's scrubbing time—the scrubbing crew. Floors in the plant are scrubbed at least once every three weeks; those that require it, more often. Sweeping is a daily job everywhere, a several-times-a-day job in many departments, and at frequent intervals walls and ceilings are thoroughly vacuumed. All this work is



With decentralized maintenance scrubbing has become a planned operation which is performed without slowing production. Machine shop floor used to take 12 men 10 hours. Now 4 men do it in 6. The leadmen operates the scrubber; two men handle the water; a fourth does odd jobs, all four working efficiently as a well-trained team. This kind of planning pays out in time-saved, results achieved

Dry scrubber (left) is used to remove concentrations of paint from paint shop floor. All plant floors are scrubbed at least once every three weeks

Sweeping is at least a daily job everywhere. Many departments are swept several times a day. At frequent intervals walls and ceilings are thoroughly vacuumed (below). All this is done on schedule



done on schedule and by as efficient means as possible, all developed by the supervisor of plant cleaning.

To stimulate supervisors to develop new and more efficient methods of handling their work, regular meetings are held, at which problems are discussed, costs analyzed, ideas advanced and considered, and all possible means for improving maintenance efficiency discussed. From these meetings have come many valuable innovations which have been adopted as a permanent part of the maintenance organization and procedure.

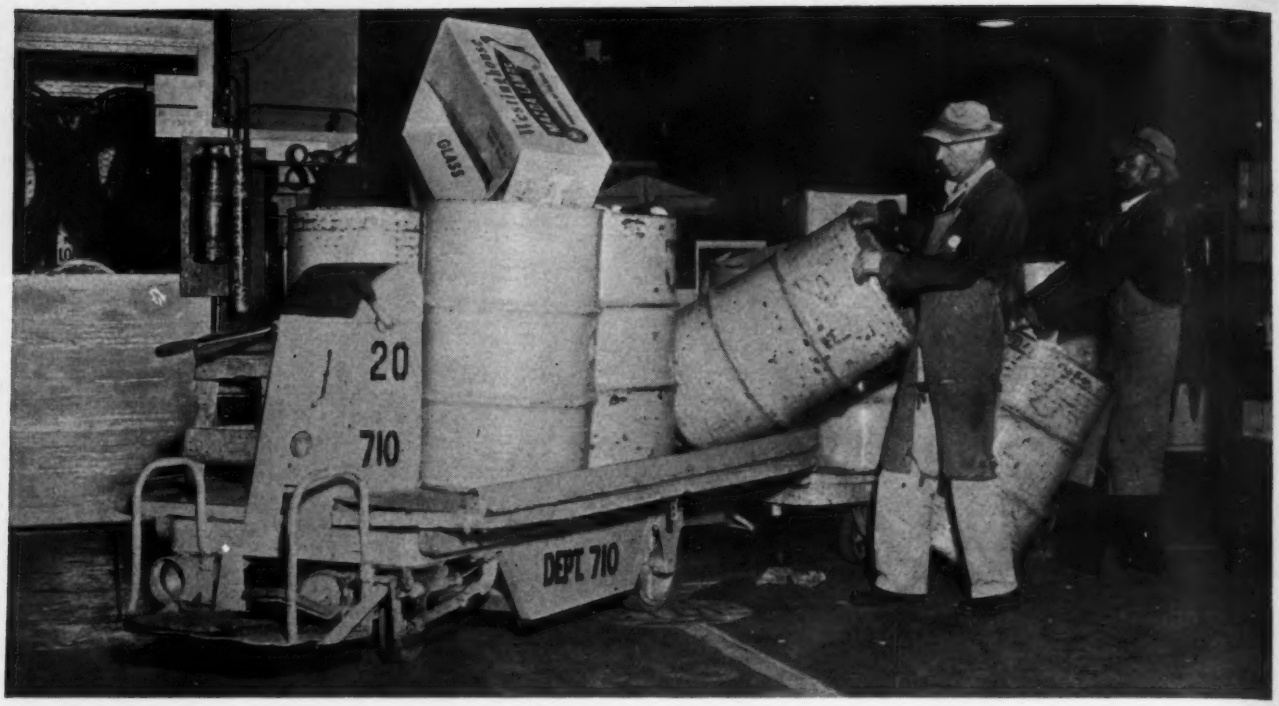
Quick Promotion

Another advantage of the new type of organization is the easy graduation from one job to the next. This makes it possible for a man of average ability and good character to look forward with reasonable confidence to promotions at fairly regular intervals and to be fairly sure that he will have the necessary training and background to handle his new responsibilities. This fits in admirably with the company policy of filling empty positions from within its own ranks wherever possible.

This opportunity for promotion has been of outstanding importance in maintaining high morale as evidenced by the fact that nearly 20 percent of the men in the maintenance departments have been with the company five years or longer.

This organization which makes the step from one job to another an easy one has also been instrumental in enabling Douglas to furnish trained maintenance personnel to new plants in all parts of the country without disrupting the functioning of the organization at the Santa Monica plant. If such a system had not been in effect, the problems of staffing the maintenance divisions of these new plants, erected to meet the war emergency, would have been more numerous and more difficult.

Incidentally, the maintenance department also serves as a proving ground for production employees. When a job applicant has no experi-

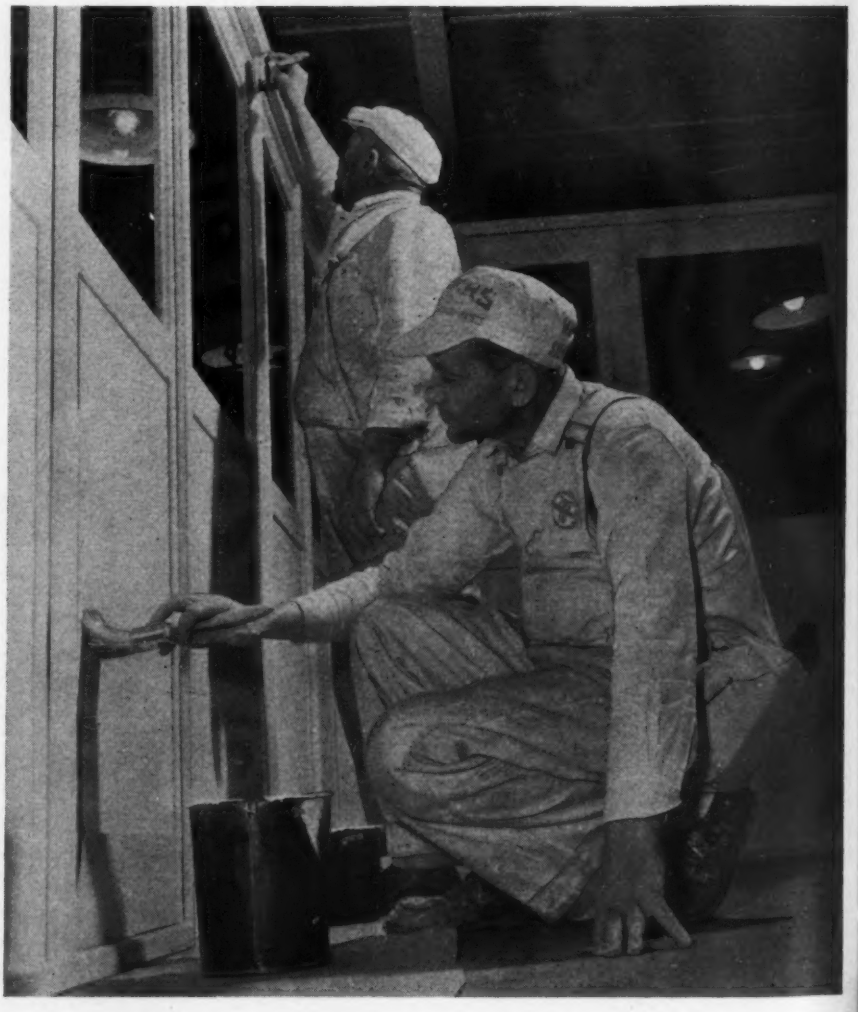


With the new maintenance plan it has been possible to set up a regular routine for general plant cleaning. The motorized pick-up crew (above) is followed in quick succession by the sweepers and the scrubbers—if it's scrubbing time. Painters (below) are constantly at it, work to regular schedules

ence in any line that would fit him for specialized duty, he is hired as a plant cleaner because anyone can do this work. During the first 30 days, he sees plane-building at first hand and has an opportunity to decide what production job or specialized maintenance task he can handle best. At the end of this period he may apply for transfer. Out of 200 men hired on this basis, probably 20 will be kept as cleaners and the remainder transferred to more important jobs.

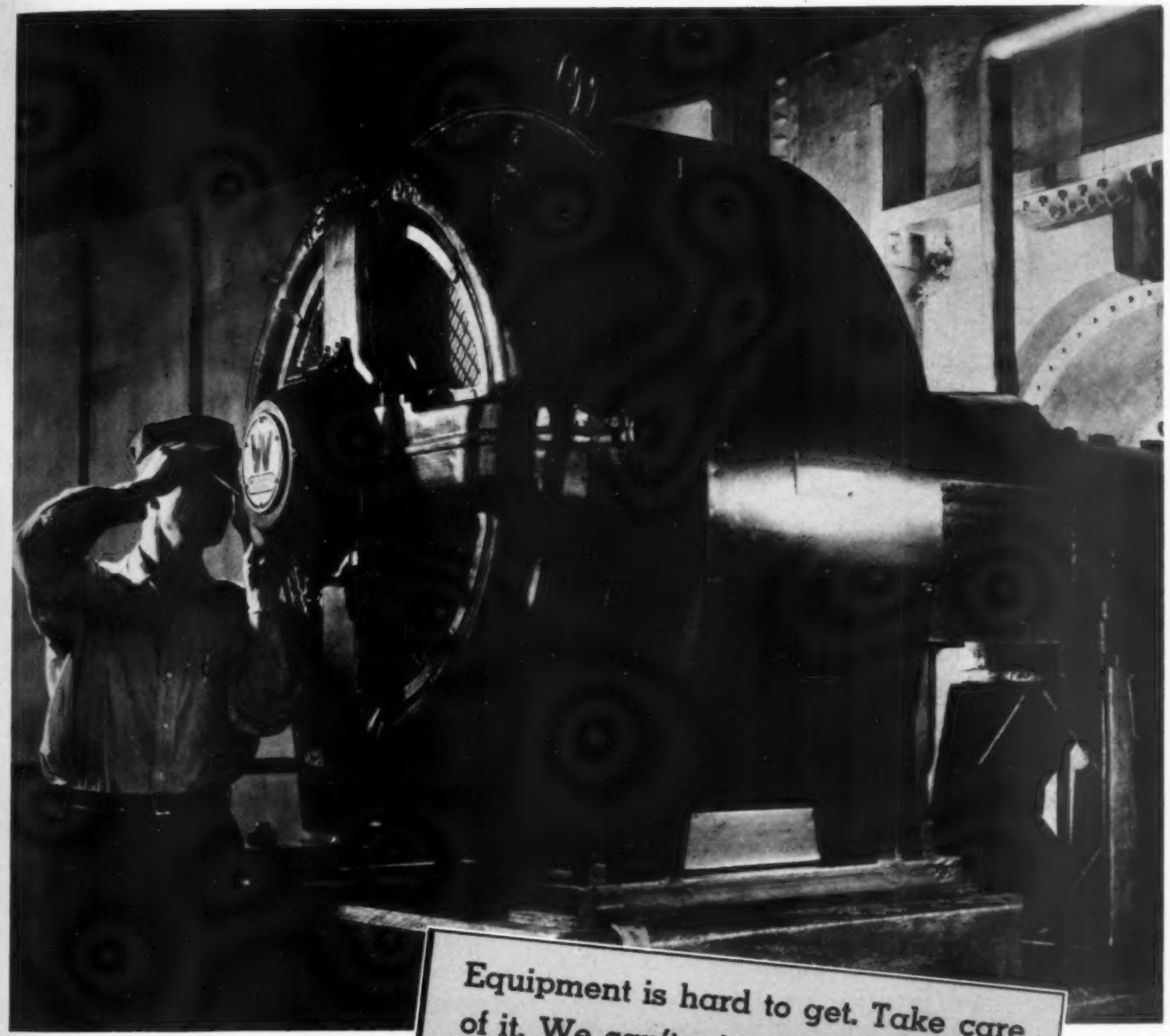
Gratifying Results

Results of the two years of experimentation with the decentralized maintenance program and with the organization that has been developed to accommodate it, have been highly gratifying. It has permitted maintenance costs in proportion to total operating costs to be reduced at least 25 percent, and this cost ratio has been as low as 3 percent of total production cost. It has materially reduced the percentage of inoperative machine hours. The plant has been kept in top condition of cleanliness and repair, and many trained employees have been transferred to new plants to assist in getting them into war production as soon as possible. Much remains to be done; scarcely a week passes that some new scheme is not tried out hoping that further improvement in maintenance efficiency can be achieved.



HOW TO GET THE MOST OUT OF

Electric Motors



Equipment is hard to get. Take care of it. We can't win without it

An Eight-Page Editorial Feature

MARCH, 1943

FACTORY MANAGEMENT AND MAINTENANCE *PLANT OPERATION LIBRARY NO. 60*

MOTORS
How to Apply Them Properly

INSTALL IN DRY PLACES

1. Install Motors in Clean, Dry, Ventilated Places

Any motor gives better service, lasts longer, requires less attention if the windings and other parts are not exposed to dirt and damp. Some of the energy put into a motor is transformed into heat which must be continuously dissipated; otherwise the motor will overheat, probably burn out. Good ventilation is essential.

2. Use Protected Motors in Wet or Dusty Places

When open motors are subjected to water, coolant, or any other liquid, trouble is just around the corner. Windings can be given special treatment to make them more resistant, but it is usually better to use a type of inclosed motor in which the windings are adequately protected. Large amounts of dust tend to clog ventilating ducts, causing overheating. Cast-iron dust is particularly harmful. In hazardous locations use only approved types of motors.

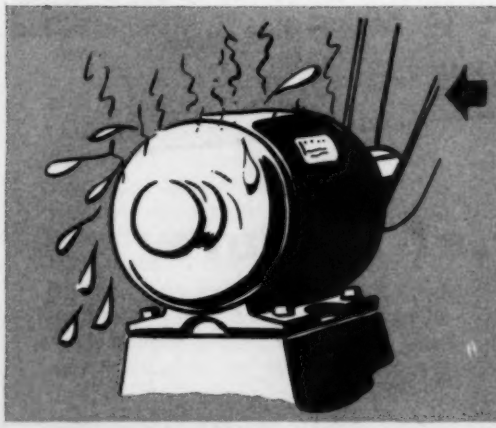
FOLLOW THE CODE

3. Connect Motors Properly

Almost anything can happen if a motor is improperly hooked up. Connection diagrams shown on nameplate or obtainable from the manufacturer are much safer guides than memory.

4. Install Wiring in Accordance With the Code

Any advantages gained in cutting corners when installing wiring are likely to be temporary and costly. Following the provisions of the Code will prevent unsafe practices and do much to insure continuity of service.



DON'T Overload Motors Too Heavily

Motors are a little stronger than their makers admit on the nameplates and can carry some overload continuously, more temporarily. When too much load is piled on, they develop a high fever, may kill themselves trying to carry it

DON'T Store Motors in Damp Places

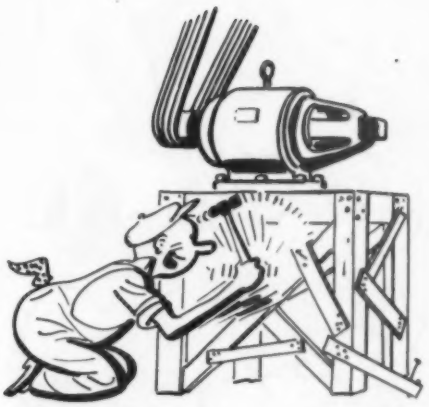
Insulation of idle motors can soak up enough moisture in damp air to reduce its strength to the danger point

5. See That Voltage and Frequency Are Correct

All motors perform best when operating at rated voltage. With a.c. motors frequency must also be considered. In general, a.c. and d.c. motors can be operated successfully on voltages 10 percent above or below nameplate value, although some characteristics will be changed. Voltages below normal are particularly objectionable. Avoid frequency variations of more than 5 percent above or below motor rating.

6. See That Motor Is Properly Aligned

Misalignment of the motor and its load may have several serious consequences – excessive bearing wear, overload on the motor, a bent shaft, rapid wear of belt or chain drive, vibration. It's easier and less costly to align a motor properly when it is installed than to repair the damage caused by misalignment.



MOUNT ON RIGID SUPPORTS

7. Use High-Speed Motors

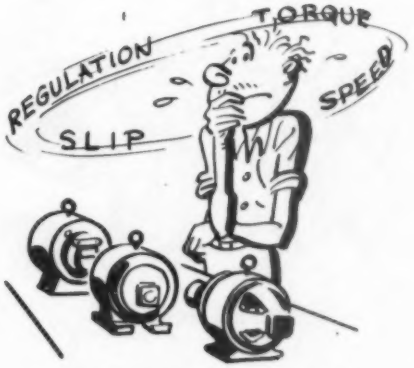
They are less costly, smaller, lighter, and operate at higher efficiency than those designed for low speeds.

8. Mount Motors on Rigid Supports

A support that is not sufficiently strong or firm may be warped by the heavy pull of a belt, resulting in misalignment. Also it may permit excessive vibration, which is bad from every standpoint.

9. Be Sure the Control Is Suitable

A control has to do any number of important things, such as start and stop; protect against harmful overloads; regulate acceleration; give undervoltage protection or release; provide dynamic braking. Suit the control to the motor and the load.



MATCH MOTOR AND LOAD

10. See That Motor Matches Load Requirements

It isn't enough that a motor develop sufficient horsepower to drive its load. Match motor characteristics (starting torque, slip, speed regulation are examples) with those of the load (such as inertia, extent of steadiness, speed requirements).

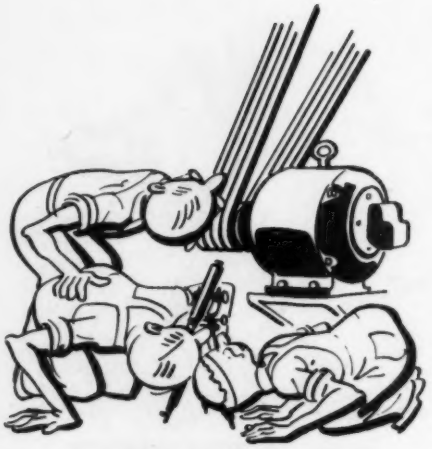
DON'T Underload Motors

Underloading induction motors creates low power factor, which ties up generator and power-line capacity, and may cause overheating. Any motor that is not carrying full load is wasting precious materials

DON'T Install Motors in Inaccessible Places

Motors that are difficult to reach are certain to be neglected. That means trouble and probably early failure

MOTORS
What to Look For on Inspection



CHECK ALIGNMENT

11. Examine Sleeve Bearings for Wear

When bearings wear sufficiently to permit the rotor to rub the stator, the result is usually a sick motor. Bearing wear can be estimated closely enough, on a routine examination, by measuring the airgap at intervals which experience shows are safe.

12. Check Motor Alignment

Alignment is something that is here today and somewhere else next week. Settling of foundations, floors, or supports, and the wear of bearings tend to throw shafts and machines out of line.

INSPECT BRUSHES

13. Examine the Commutator

At best, commutators are subject to wear because they cannot be lubricated and are exposed to dust and friction of the brushes. Look for grooving, roughness, blackening.

14. Inspect the Brushes

Free movement in the holders is essential. Also brushes must make good contact with the commutator over the entire face. Look for uneven wear of brushes, chipped edges, too much or too little tension.

15. Watch the Oil Level

Oil is continuously being lost from reservoirs and may drop below a safe level unless it is added to frequently. Check the level weekly, oftener with important motors, when the machine is idle.

DON'T Try to Measure Temperature by Feel

Motors will safely withstand temperatures that the hand cannot. When in doubt, or if an accurate check is needed, use a thermometer

DON'T Run a Motor that Shows Defects

Overheating, noise, sparking, low speed—these are signs that a motor is sick and needs attention. Neglect to give needed care promptly may result in serious damage

16. Examine the Oil Rings

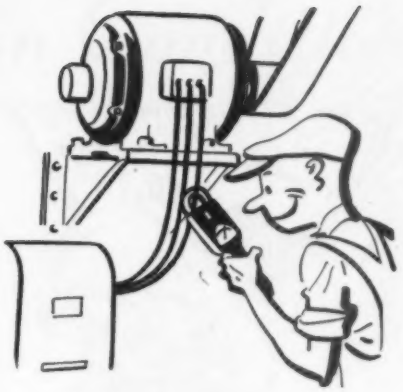
Oil rings may for some reason fail to revolve and carry oil up to the journal. When the oil supply is cut off, a bearing soon grows dry. Then there is a shutdown and a costly repair job, for which there is usually no good excuse.

17. Check Grease in Antifriction Bearings

Adequate protection of such bearings is provided when the housings are from one-third to one-half full of a suitable grease. Check every three to six months.

18. Measure Current Input to Motor

A check every six months or oftener of the current drawn by the motor helps to prevent under- or overloading, and indicates abnormal conditions in the motor or the driven equipment.



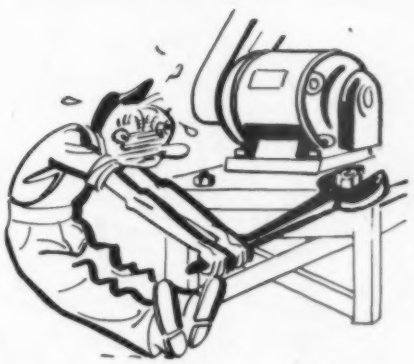
MEASURE INPUT

19. Inspect the Drive

Look at alignment of couplings, gears, chains, belts, belt tension, vibration, smoothness of operation.

20. See That All Nuts Are Tight

In this check include any parts that may work loose, such as motor end shield and foot bolts; setscrews; pulley, coupling, and gear keys.



TIGHTEN ALL NUTS

21. Examine Drive Covers and Guards

If such parts work loose, they may become entangled in the drive with resultant damage to the motor. See that they are in good condition, in their proper places, and securely fastened.

22. Watch Motor Temperature

Abnormal heating is a certain and easily detected indication that something is wrong. Keeping tab on winding and bearing temperatures may disclose trouble before it becomes serious.

WATCH TEMPERATURE

DON'T Over-Oil

Oil and grease are the elixir of youth to bearings, but a dangerous saboteur to windings. Oil deteriorates insulation, catches and holds dust, thus restricting ventilation

DON'T Overload Motor Bearings

They are husky and will stand any reasonable burden, but abnormal loads—excessive belt tension, for example—may send bearings to the scrap heap long before their time

Omaha Public Library
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MEASURE INSULATION RESISTANCE

23. Measure Insulation Resistance

A single reading may mean comparatively little, but the results of a number of tests over a period will show whether insulation is holding up or failing. Depending on the size, age, and importance of a motor, test at intervals of once a month to yearly.

24. Inspect Armature Bands

Shrinkage of insulation tends to loosen armature and rotor bands, permitting coil movement that ultimately results in failure. Examine bands once a year.

25. Inspect Coil Leads and Commutator Connections

See whether bands over leads have become loose or damaged. Examine leads for damage to insulation. Also examine condition of necks and soldered connections.

WATCH GROUND CONNECTIONS

26. Examine Exposed Motor Leads

See that all exposed wiring is clean and free from grease, oil, and moisture; and that the insulation is in good condition.

27. Watch Ground Connections

Ground connections protect personnel. At frequent intervals – once a week is not too often – see that all connections are tight and conductors are in good condition.

28. Inspect the Control

See that all parts are clean and in good condition. Make sure that heater coils of overload relays are of the correct rating. Verify overload relay settings two or three times a year.

DON'T Let Liquids Splash on Open Motors

Open motors are allergic to liquids. When in good condition, they can stand an occasional dousing with liquids that are not corrosive, but repeated or prolonged exposure is certain to result in damage

DON'T Expose Open Motors to Corrosive Fumes

Acid fumes or any corrosive materials attack both insulation and metal of any motor whose windings and parts are not properly protected

MOTORS
How to Keep Them in Condition

29. Dry Out Wet Windings

If windings absorb moisture or become wet, dry them out thoroughly by passing low-voltage current through them, applying external heat, or baking in an oven.

DRY OUT WINDINGS

30. Keep Motors Clean

Pay particular attention to ventilating ducts, windings, and brush riggings. Use suction or compressed air at not more than 50-lb. pressure, preferably less.

31. Overhaul Motors Periodically

Likelihood of breakdowns is decreased and life lengthened by dismantling motors and carefully inspecting parts. Repair or replace those that are defective or worn. Usually an overhaul every five years is sufficient, although with motors in severe service it can be done profitably every year or two.

OVERHAUL PERIODICALLY

32. Keep Windings Free From Oil and Dirt

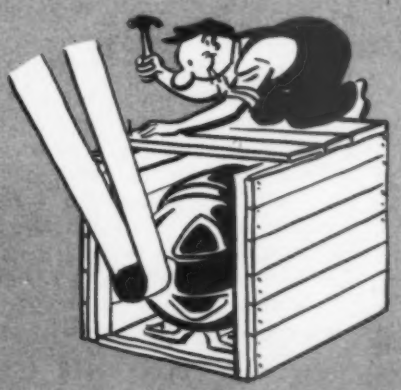
Oil tends to deteriorate insulation and causes dirt to stick. Remove both oil and dirt by brushing or spraying the windings with carbon tetrachloride (pure or cut with 40 percent white gasoline) or safety

DON'T Expose Motors to Excessive Heat

Motors, like people, can do more work when the air about them is cool. In hot places motors must be permitted to take it easier, to keep the temperature rise within safe limits

DON'T Obstruct Ventilation

Motors need plenty of air to carry away the heat generated when they are working. If ventilation is seriously restricted they will suffocate, become overheated



solvents. After cleaning, dry the insulation and brush or spray on high-grade baking or air-drying insulating varnish.

33. Eliminate Vibration

Whatever the cause – and there are several – vibration is harmful to motors. If examination of the motor does not reveal misalignment, loose bolts, an unbalanced rotor, weak mounting, or other possible cause, examine the driven machine.

REPLACE GREASE

34. Replace Grease Periodically

Grease in antifriction bearings tends to deteriorate and must be replaced once a year or oftener. Avoid adding too much grease; it causes overheating.

35. Keep Commutators Smooth and Clean

Remove dirt by wiping with a clean cloth free from lint. Smooth rough commutators with a commutator stone or piece of sandpaper supported on a wood block, with the motor running idle.

TURN ROUGH COMMUTATORS

36. Turn Down Rough Commutators

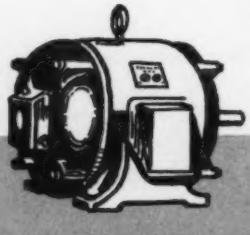
If commutators become very rough or badly grooved, turn them down; but remove only enough metal to produce a smooth surface. Polish with fine sandpaper and undercut the mica. Reseat the brushes before putting the motor in service.

37. Lubricate Motors on a Regular Schedule

Some motors may require oiling daily; others need lubrication only at much longer intervals. The important point is to see that every motor is lubricated at the proper time. That requirement can be met best by a definite schedule based on experience or manufacturers' recommendations.

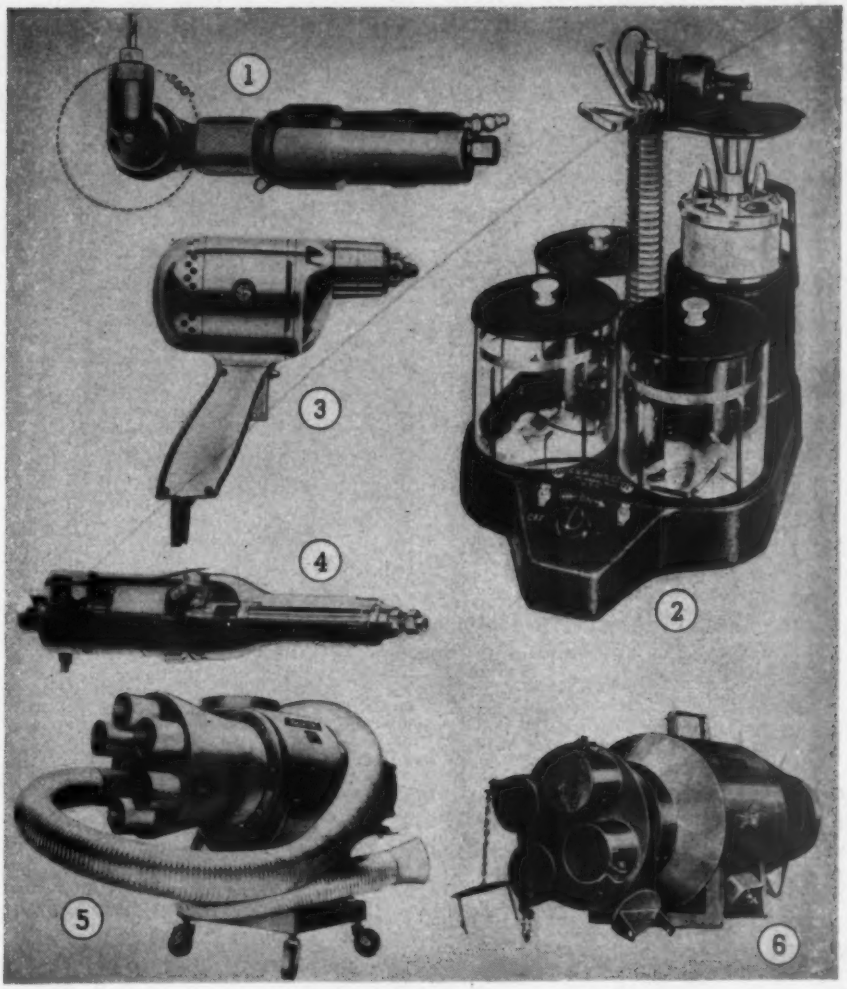
38. Keep Sliprings Smooth and Clean

Sliprings, like commutators, tend to get dirty and rough. Wipe at regular intervals to remove dust and dirt. When rough, smooth with sandpaper or a stone, or turn down. Reversing polarity of rings periodically helps to equalize wear.



Power Tools that Go to the Job

The portable equipment introduced to you by *Factory* during the past 12 months is reviewed here to give you a quick one-year summary



AIR COMPRESSORS, gas-driven, with wheelbarrow carriers. Designed for camouflage work on roofs of buildings, general maintenance painting, waterproofing, masonry repointing. Three and 4 horsepower. P. K. Lindsay Company, Everett, Mass.

ANGLE DRILL of "junior" size for use on flexible shaft or flexible shaft extension of portable electric drill. Equipped with 90-, 45-, and 30-deg. or universal heads. Over-all diameters of ½ or ¾ inches. Wyzenbeek & Staff, Inc., Chicago.

ANGLE DRILL has head that can be set at any angle through 360 degrees. Head swivels in two planes and can be turned in any position. Drill weighs 2½ pounds, is about 8 inches long. Chuck is for ¼-in. drill. The Cleveland Pneumatic Tool Company, Cleveland (Figure 1).

BARREL PUMP is fully inclosed, sealed against entrance of air, dirt, grit, moisture. Pump is mounted on flanged head which fits over standard drum, permitting oil or greases to be pumped from original container. Pumping action is automatic, controlled by pressure switch. Trabon Engineering Corporation, Cleveland.

CLEANING MACHINE, operated electrically. Specially suited for instruments or small parts. Parts placed in basket travel from cleaning jar to rinsing jars, then to drying chamber. Basket is 5½ inches wide, 3⅜ inches high. L & R Manufacturing Company, Newark, N. J. (Figure 2).

COOLANT PUMP is suitable for 24-hour use on lathes, screw machines, drill presses, grinders. Ranges in capacity from 150 to 1500 g.p.m., with tanks 3½ to 15 gallons. Features non-clogging centrifugal pump, no gears or close-fitted parts, no metal-to-metal contact, portability. G. B. Spiegel Corporation, Chicago.

DRILL contains universal motor with speeds from 750 to 5000 r.p.m. Switch has locking pin in center of trigger, for either right- or left-handed operator. Streamlined construction, close coupling enable it to be used in cramped quarters. Air cooled. The United States Electrical Tool Company, Cincinnati (Figure 3).

ELECTRIC TOOL, powerful but light, can be used for grinding, cutting, polishing, etching. Will work in openings as small as 1 to 1⅛-in. diameter, to a depth of 6 inches. Powered with universal motor developing ¼ horsepower at speeds from 35,000 to 20,000 r.p.m. Precise Products Corporation, Racine, Wis. (Figure 4).

EXHAUSTER-BLOWER can be quickly converted from exhauster to fresh-air blower. Hooked up by flexible metal hose. Heavy-duty motor has overload protection. Trade-named "Octopus." Chelsea Fan & Blower Company, Irvington, N. J. (Figure 5).

EXHAUSTER-BLOWER, small edition of above, known as "Octopus Jr." Portable unit, to eliminate gases and fumes from places such as shipholds, welding rooms, basements. Powered by ¾-hp. ball-bearing motor, it sucks or blows 2000 c.f.m. Can be operated in any position, weighs only 70 pounds. Chelsea Fan & Blower Company, Irvington, N. J. (Figure 6).

FORCE PUMP pumps sealing materials, insulating materials, sound deadeners, putty, viscous grease, heavy lubricants directly from original container to point of application. Forced-

induction priming principle is used. The Lincoln Engineering Company, St. Louis (Figure 7).

GRINDER contains ball bearings mounted in steel inserts on armature and ends of wheel spindle to absorb thrust, eliminate vibration, and insure cool operation. Straightline ventilation blows dirt away from operator, prevents clogging. Features universal motor and rubber sleeve handle. Skilsaw, Inc., Chicago.

LUBRICATOR, each unit a complete lubrication department. Control and meter register amount of lubricants used. Outlets provide for high-pressure and volume lubrication. Facilities for handling all grades of grease. Supplied with air compressor or air hose. Alemite Division, Stewart-Warner Corporation, Chicago (Figure 8).

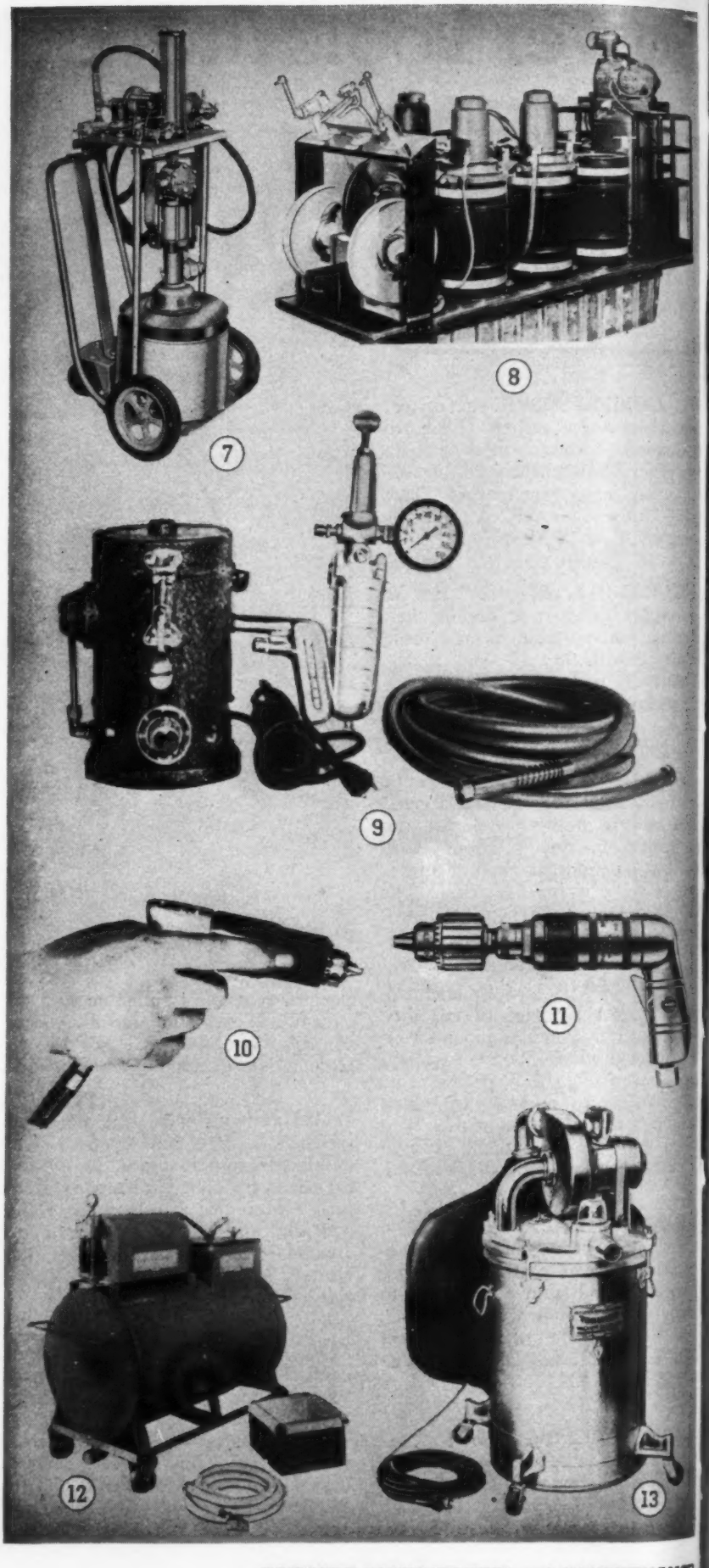
METAL SPRAYER, self-contained, equipped with electrical elements for heating metal in insulated pot. Rheostat switch knob to control temperature. Will spray any neutral alloy with melting temperature up to 600 degrees Fahrenheit. Alloy-Sprayer Company, Detroit (Figure 9).

PNEUMATIC DRILL weighs less than 2 pounds. Powered by multivane motor. Contains built-in speed regulator, split-second throttle action. Chuck shield offers protection, enables the operator to guide the drill by grasping the shield with the fingers of his free hand. Ingersoll-Rand Company, New York (Figure 10).

PNEUMATIC DRILL, rotary air drill, straight and right angle, of $\frac{3}{8}$-in. capacity for a wide range of jobs. The Aro Equipment Corporation. Bryan, Ohio (Figure 11).

SUMP TANK CLEANER, self-contained, automatic. Pumped liquid does not pass through pump; sludge basket separates solids. Pump motor, 12-hp. capacity, shuts off when tank is full. W. R. Carnes Company, Madison, Wis. (Figure 12).

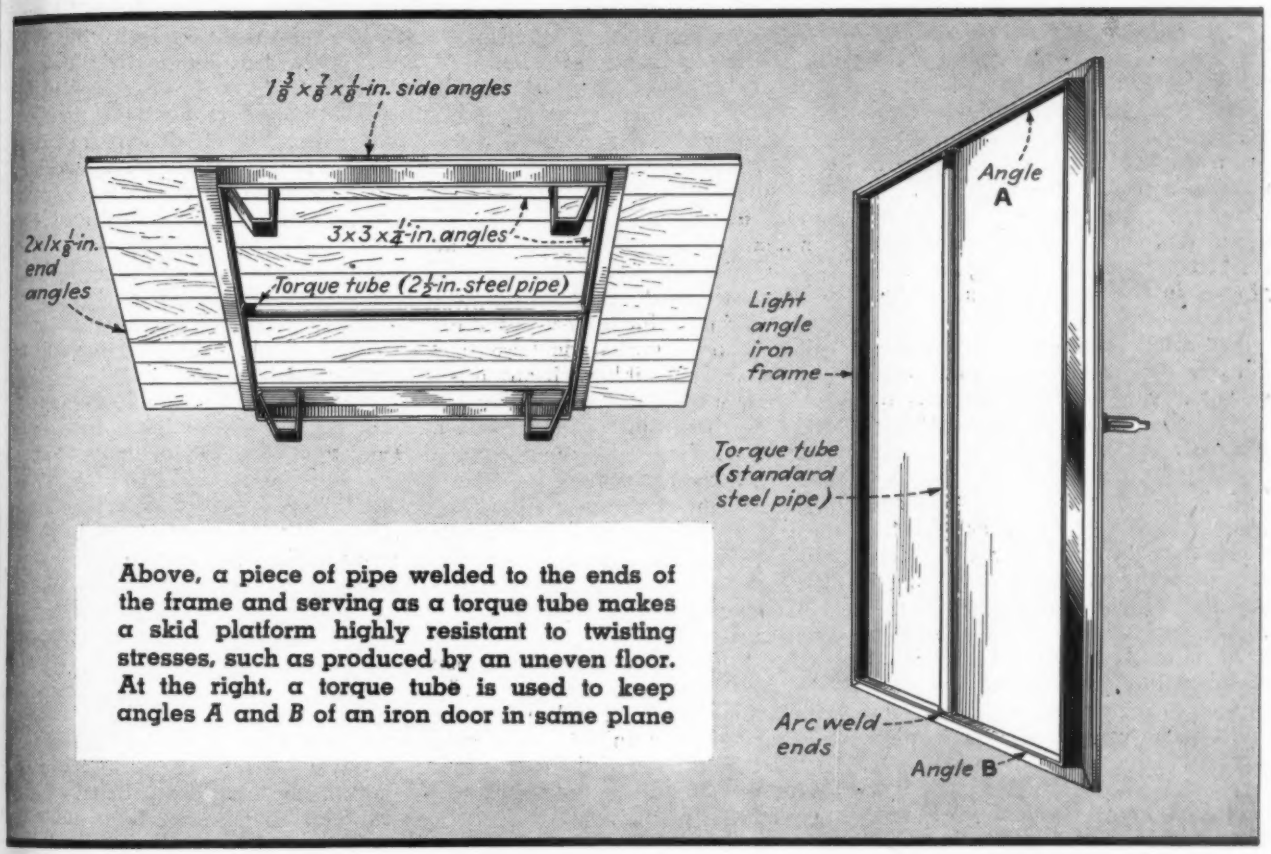
VACUUM CLEANER features high-speed operation and durability. High rate of speed develops suction strength required for picking up welding flux, scrap, heavy particles of dust or dirt, water. Known as "Tornado." Breuer Electric Manufacturing Company, Chicago (Figure 13).



Welding Saves $5300 a Year

The maintenance department in this plant employs arc welding in repairing worn or broken equipment and in building new devices, finds that intangible savings are about as big as those that can be calculated accurately

CARLMAN MARTIN RINCK, Chief Engineer, Trenton Potteries Company, Trenton, N. J.



Above, a piece of pipe welded to the ends of the frame and serving as a torque tube makes a skid platform highly resistant to twisting stresses, such as produced by an uneven floor. At the right, a torque tube is used to keep angles *A* and *B* of an iron door in same plane

OUR MAINTENANCE WELDING involves: (1) The repairing of broken or worn parts of equipment; (2) the construction of special machines and equipment of our own design. Savings through the use of arc welding are estimated at $5315 a year.

Welding equipment was first purchased for making repairs, but it later became evident that this equipment was becoming even more valuable to us in the fabrication of special welded machines and equipment, which we make for own own use.

Time required is kept for each welding job that has a number, and is recorded and charged against the respective job number. We are thus able to keep accurate labor costs. Many of our repair jobs are so small that we do not attempt to keep track of the rod and electricity cost. This cost is spread over the various machines repaired. When fabricating and constructing new equipment, however, the rod and electrical costs are taken into consideration because there is generally a substantial amount of welding when this type of work is undertaken.

Whenever speed is paramount, we bring our welding equipment to the machine so that, without disassembling it, the necessary repairs can be made right on the floor.

Among the typical repairs made by arc welding can be included:

1. *Elevator door guides.* These guides, which are bolted to the vertical elevator hatchway members, have a door stop riveted on them that takes a heavy shock load when the doors are slammed shut. Formerly this constant slamming continually sheared off the bolt heads. We now arc weld the guides to the vertical hatchway members and have entirely eliminated this source of trouble, at an estimated saving of $150 a year. In addition, the saving in the cost of production delays may run into hundreds of dollars.

2. *Screw conveyors and other conveying equipment.* Wear on this

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This study won an award in the recent Industrial Progress Award Program of the James F. Lincoln Arc Welding Foundation.

equipment is a continuous problem in the ceramic industry because of the enormous tonnage of abrasive materials handled. Flint, spar, and all types of clays, grog, and other materials wear down the toughest steels. Arc welding has enabled us to reinforce wearing edges and surfaces with hard alloys, thereby greatly extending the useful life of such equipment.

The cost of repairing screws, and other parts used to be approximately $1870 a year. Arc welding saves us approximately $1246 a year for these repairs alone.

3. *Puller chain channel guides.* These guides are on the floors of the exit ends of the tunnel kilns. Wareplacing sand that drops down from the kiln cars acts as an abrasive between the links of the puller which is made of a special alloy steel, and the chain guide and formerly soon wore down the comparatively soft structural steel guide. Reinforcing the worn grooves in the guide with alloy steel has minimized this trouble.

Estimated saving on our six tunnel kilns is approximately $480 a year, since the alloy reinforcement has increased the life of the guides between repairs from two years to four years.

4. *Installing nipples in steam and water mains.* Instead of cutting the main line, taking down a section, threading the ends, and installing a tee and a union, we merely weld a nipple into the main line and screw a valve on it. This job can be done very rapidly with a minimum of downtime.

Savings in the cost of fittings and time by arc welding nipples in place were $148 last year.

5. *Bending and welding mold reinforcement rods.* Heretofore, these rods were bent cold and hammered into shape with the result that no two were alike. Sometimes they were so bent that they did not perform their function. Now we make jigs for the various shapes and arc weld corner braces where additional support is needed.

The saving involved in this item is approximately $246 a year. In addition, we have a much more substantial reinforcement.

When new products are designed it is up to our engineering department to design the molds, lifting rigs, and mechanical means for producing the new ware.

Before green or plastic ware is fired it is necessary to eliminate any possible strain in the piece while handling. After much studying and experimental work with welding, we are able to produce ware setters and skid platforms capable of supporting 1-ton loads without perceptible deck deflection. Also a variety of special machinery and appliances.

For many years the ceramic industry has been using 42-in. vertical wheel grinders with extremely heavy carriages. These carriages, which are made rugged to resist distortion, require three men to move them back and forth across the face of the grinding wheel.

After study it was decided that a lightweight, welded carriage made of structural steel would have far less inertia, thus permitting a faster grinding stroke and a greater number of strokes a minute. Since we wanted rigidity with lightness, we incorporated a torque tube as a cross member, which gave the carriage rigidness beyond all expectations.

The torque tube is a section of common steel pipe welded to the channel side members. It is highly resistant to twisting or a torsional load. We have found that this tube will give much greater rigidness to a plane than is possible with any other kind of simple bracing having an equal weight of metal in it. When weight is a factor, we use this tube design wherever possible.

The weight of the new arc welded carriage is 630 pounds, whereas the original cast-iron carriage weighed 1740 pounds. There is approximately a $244 saving in the construction of each carriage.

Due to its lighter weight one man can now handle the carriage easily, eliminating two men, and make more cutting strokes a minute than were possible by the use of the torque tube principle in imparting rigidness to the deck of the platform.

As mentioned before, extreme care must be exercised in the handling of green ware before it is fired. The slightest weave in a platform on which a semi-plastic piece of ware is placed may cause cracks or internal stresses.

By using the torque tube as bracing, the deck becomes so rigid that a 2500-lb. load spread uniformly over it does not cause any noticeable distortion when the skid is placed on a floor so uneven that only three of the four legs rest on it.

The estimated savings due to reduced handling cost and breakage of green ware amount to several thousand dollars a year when the mold cost and overhead are taken into consideration. Reducing the amount of spoilage in ceramic manufacture results in larger savings.

Steel doors and other large flat surfaces are also made rigid with this simple, arc welded torque tube design. This method of bracing has many possibilities where lightness, rigidity, and simplicity of design are paramount. It is essentially an arc welding job because, where the tube is usually used, the thickness or depth of the reinforced plane must be kept at a minimum. The use of flanges to hold the tube to the end members is impossible because of lack of room and the possibility of the pipe turning in the flanges.

Reducing the wear on floor scrapers, shovels, picks, grub hoes, and other hand tools used in handling our abrasive raw materials results in a saving of $125 yearly. Arc welding has made it possible to line the wearing edges of new implements with alloy steel which increases their life many times. After the original alloy edges are worn off, we can reweld them as many times as the condition of the implement warrants.

Our estimate of $5315 savings a year by the use of arc welding is conservative, since it covers only a small part of the total work done. Large additional savings have been made on the innumerable small repair and construction jobs that can be done only by arc welding. In fact we feel that the intangible savings are in reality much greater than those that can be calculated readily.

ARC WELDING MAKES POSSIBLE THESE YEARLY SAVINGS

Attaching elevator guides	$150
Hard-surfacing conveyor screws	1246
Hard-surfacing kiln car puller guides	480
Making pipe connections	148
Making mold reinforcing rods	246
Building grinding carriage	2920
Making repairs to hand tools	125
Total	$5315

LOOK OUT, you Axis aviators! This bomber is a hornet with a sting on every side . . . protected from attack by blistering fire poured to all points of the compass.

Protection is also important here at home. Guard your equipment and tools to save vital metals . . . cut down needless waste and we can produce more war materials. Storage batteries, for example, last longer when you follow these four simple rules. Obey them all now and you're hitting the Axis. *Buy to Last and Save to Win!*

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1. Keep adding approved water at regular intervals. Most local water is safe. Ask us if yours is safe.
2. Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.
3. Keep the battery fully charged—but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.
4. Record water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings.

If you wish more detailed information, or have a special battery maintenance problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 1982.

Seven Ways to Keep Voltage Up

J. E. HOBSON, Director of Department of Electrical Engineering, Illinois Institute of Technology, Chicago, and

O. W. FREEBORN, Switchgear Division, Westinghouse Electric & Manufacturing Company, East Pittsburgh

LOW VOLTAGE, serious in many industrial plants, is created by current flow through feeder, transformer, and distribution circuits. The voltage drop through a transformer or other circuit element is due almost entirely to the reactive (wattless) kva. of the load. In some plants it has been impracticable or impossible to expand the electrical system to keep pace with the load, and existing equipment is rapidly approaching or has reached the maximum load. Consequently, the voltage drops are excessive. One or more of the following seven methods will help bring the voltage back to normal.

1. Boost Feeder Voltage. Partial relief can often be obtained by boosting the voltage at the supply end of the feeder, and power companies cooperate as far as possible in this way. However, the necessity for maintaining reasonable voltage for other consumers and equipment limitations restrict the amount of boost that can be provided.

2. Revise Present System. Voltage drops usually can be reduced by constructing new feeders, installing additional transformers, or rewiring the distribution circuits. There are cases where those measures are necessary because of thermal load capacity. However, there are many cases where intolerable voltage conditions result before the thermal capacities of the elements of the system are reached. In some plants the installation of additional facilities entails a heavy investment not justified by the temporary nature of the load and the expected short period of income return.

3. Install Low-Voltage Network. The low-voltage network has its greatest field of application in new plants or unit additions; it is often difficult or uneconomical to apply in existing plants designed for radial service. This system of distribution is well suited to meet unusual conditions, because it has inherently good voltage regulation and additions in transformer or circuit capacity can be made at a minimum of cost and equipment.

After getting his Ph.D. from the California Institute of Technology at 25, J. E. Hobson (left) taught mathematics until 1936, when he joined Westinghouse as central station engineer. Made director of the electrical engineering department at Illinois Institute of Technology in 1941. O. W. Freeborn (right) got his B.S. in electrical engineering in 1905; served in the U.S. Army for five years, joining Westinghouse switchgear division in 1912. In the Army again from 1917 to 1935, back to Westinghouse in 1936, specializing in capacitor installations

4. Use Shunt Capacitors. From an operating as well as economic standpoint, the application of shunt capacitors should be one of the first measures considered. While an improvement in voltage might be obtained at lower first cost through other means, the shunt capacitor may be more economical when its other advantages are considered. In reducing voltage drop it improves power factor and releases transformer and feeder capacity for additional load.

As a specific example, consider the case of a large metal casting plant that had difficulty starting a motor at the end of one circuit. The circuit consisted of two 500,000-circular-mil cables in parallel for a run of 900 feet. A total load of 640 amperes at 232 volts was metered at the distribution panel. The voltage metered 207 volts at the motor. The circuit continually blew fuses and delayed production until the fuses were replaced. After 135 kva. of capacitors were installed, the voltage metered 224 volts at the motor, with no change at the supply end; the current dropped to 440 am-

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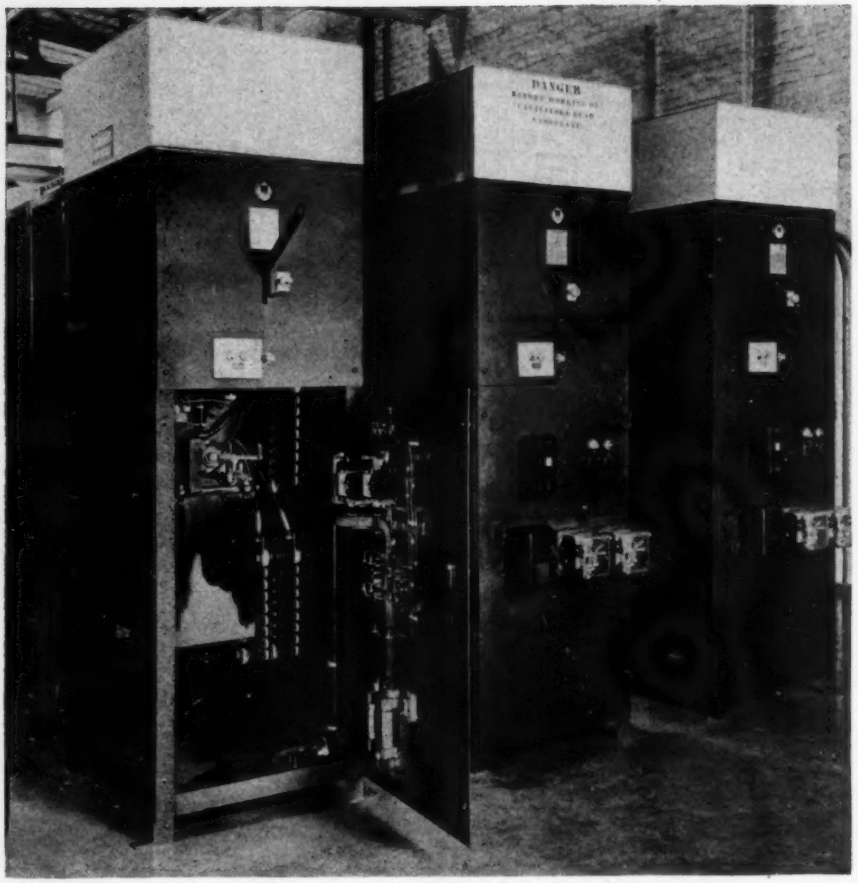
The Men and Women of

HYATT BEARINGS DIVISION

General Motors Corporation, Harrison, New Jersey



Indoor bank of capacitors with three heavy-duty switches is automatically controlled by relay to maintain voltage as load changes

peres. The motor now snaps up to speed and runs cool.

Capacitors have the advantage of being flexible. They can be segregated into several groups and applied at the most effective points. These groups are likewise flexible in the amount of correction that can be placed at a single location. The total capacity of each group can be varied to meet changing load conditions.

Where the power factor of the motor load is low, the capacitor reduces the current in the circuit below its value before adding the capacitor. Current-carrying capacity thus released permits more load to be added on the same supply circuit. The amount of voltage improvement to be obtained by the application of capacitors depends on the load power factor and the ratio of resistance to inductive reactance of the system impedances. It is often feasible to correct to a power factor of from 0.90 to 0.95, but not always wise to correct to 1.00.

In plants where the load changes considerably from hour to hour and from day to day, it may be necessary to switch all or a part of the capacitor bank on and off as the load changes. This can be done under either manual or automatic control. With automatic control and divided bank, the installation can be made to serve as a voltage regulator.

A large bank of capacitors with automatic switching is an alternative to a synchronous condenser installation and has these advantages: (1) Lower initial cost up to about 1500 kva.; (2) lower losses; (3) less maintenance expense; (4) lower operating cost; (5) shorter deliveries; (6) capacitors can be located at several points.

5. Use Synchronous Condenser on Large Loads. The synchronous condenser does have inherent advantages of reducing voltage flicker and improving stability limits not offered by shunt capacitors. If the problem is one of steady-state voltage improvement, and the amount of corrective kva. required is less than 15,000, economic considerations are likely to favor capacitors with automatic switching rather than a synchronous condenser. A capacitor bank using a multiplicity of switching steps approaches the control achieved with a condenser under automatic field control. A large number of switches is not necessary. Seven positions can be obtained with three switches used to switch three bank sections. For example, let switch *A* be connected to 180 kva., switch *B* to 360 kva.; and switch *C* to 720 kva., the seven positions obtainable are:

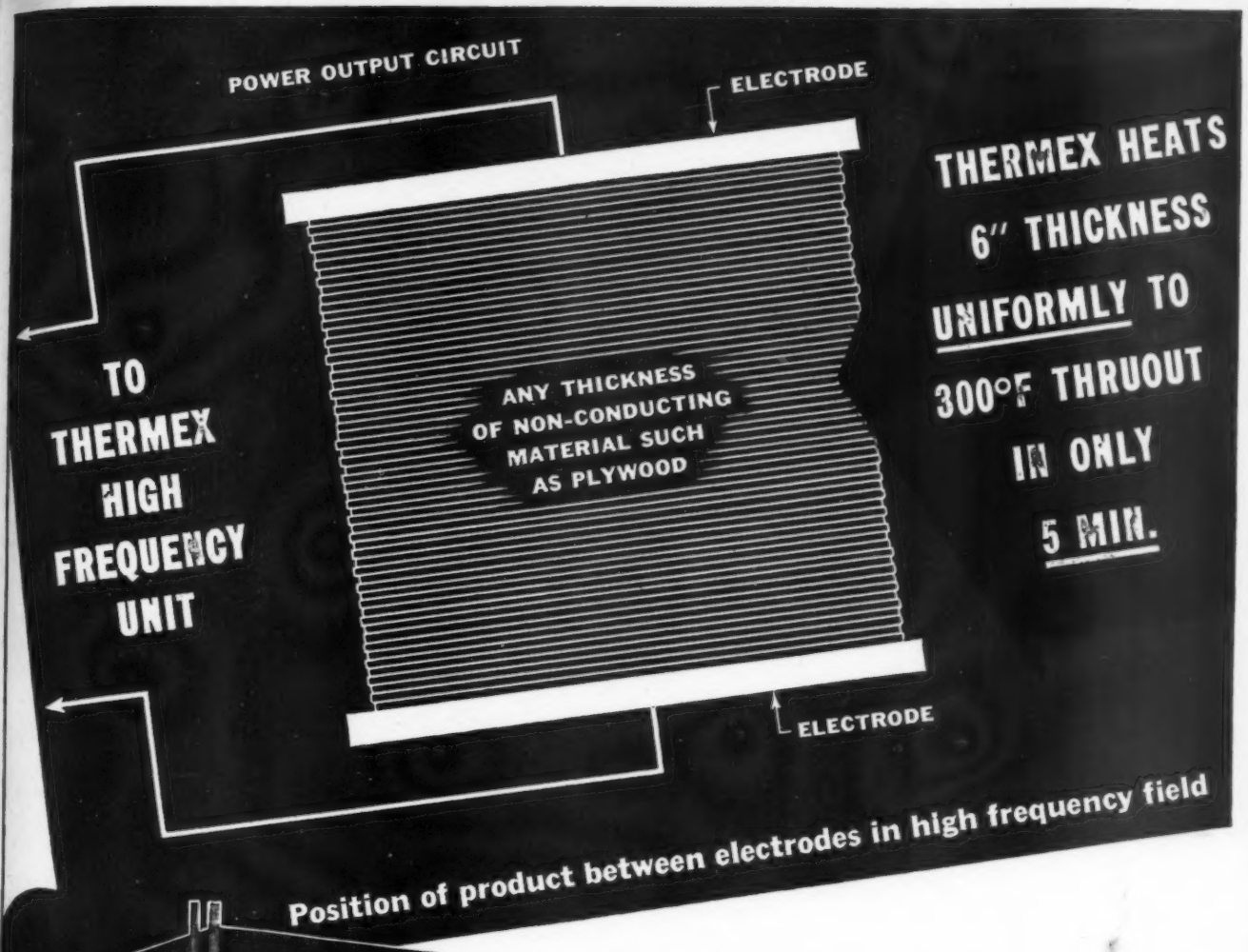
	Kva.
Switch *A* closed.....	180
Switch *B* closed.....	360
Switches *A* and *B* closed....	540
Switch *C* closed.....	720
Switches *A* and *C* closed....	900
Switches *B* and *C* closed....	1080
Switches *A*, *B* and *C* closed..	1260

Shunt capacitors are not of assistance in the reduction of flicker-voltage fluctuations since they produce a fixed amount of corrective kva. Automatic voltage regulators and transformers tap changing under load are of little benefit since the mechanism cannot respond fast. Reduction of circuit impedances by recoppering, building additional lines, and installing additional transformer capacity are beneficial.

6. Use Series Capacitors. Series capacitors, inserted in the line to neutralize all or a part of the system reactance, are of benefit in the solution of flicker problems. Series capacitors are most effective if the ratio of system resistance to reactance is low, and if the power factor of the fluctuating load is also low. When properly applied, series capacitors provide instantaneous automatic correction with maximum dependability. There is one important difference between the correction effected with series and shunt capacitors: Shunt capacitors, correcting sustained voltage conditions, improve voltages on the system on the supply side of the installation; series capacitors, correcting either sustained or fluctuating voltage conditions, improve voltages on the load side of the installation. For this reason, and from economic considerations, series capacitors do not often prove to be the best engineering solution for sustained undervoltage.

7. Install Booster Transformer. The series booster transformer is suggested as yet another method of minimizing the effects of fluctuating loads on circuits requiring steady voltages. The booster transformer is connected to insert a compensating voltage (in tapped lines supplying other loads) proportional to the voltage drop produced by the offending load.

It is necessary to investigate several of the corrective schemes for each particular situation. Selection of the scheme to be used is determined largely by economics, after considering all of the points of each method.


POWER OUTPUT CIRCUIT
ELECTRODE
TO THERMEX HIGH FREQUENCY UNIT
ANY THICKNESS OF NON-CONDUCTING MATERIAL SUCH AS PLYWOOD
THERMEX HEATS 6" THICKNESS UNIFORMLY TO 300°F THRUOUT IN ONLY 5 MIN.
ELECTRODE
Position of product between electrodes in high frequency field

No. 15 portable Thermex unit. Size: 37" wide, 64" deep, 80" high. Net weight: 3000 lbs. Operates on 220 volt, 60 cycle, 3 phase power service. Five standard sizes available.

Uniform, faster bonding or heat processing of any non-conducting material with Thermex!

Thermex high frequency equipment heats entire mass evenly . . . saves hours over other methods!

The above diagram shows how non-conducting materials may be bonded or heat processed *uniformly* and *quickly*. In this example, a six inch stack of non-conducting plywood panels is heated to 300° F. thruout in only five minutes with Thermex! At least ten hours is required to do the same job by any other method such as with hot plate conductive equipment.

With Thermex, heating is *absolutely* uniform regardless of the thickness of the mass or material. High frequency heating is ideal for practically every non-conducting material. Some of the many advantages of Thermex include: less handling of product, reduced labor cost, no variation in batch production, no surface damage, less danger of overheating, heating can be stopped instantly, no "hot plates" or steam required.

Find out how this remarkable new industrial heating equipment can help in your production. Send for free illustrated booklet today!

MAINTENANCE SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary maintenance accomplishments. Accepted articles will be paid for

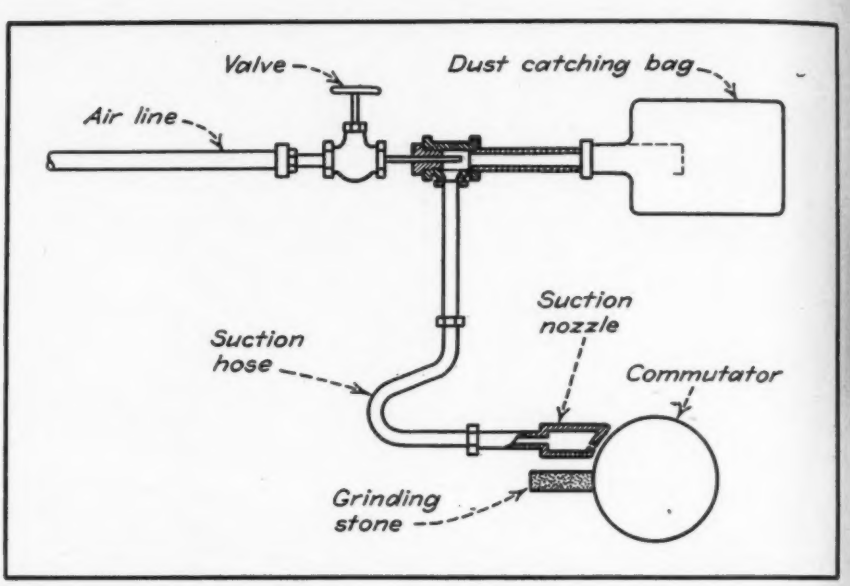
Vacuum Cleans Dust From Commutator

S. H. SLEMAN, New York

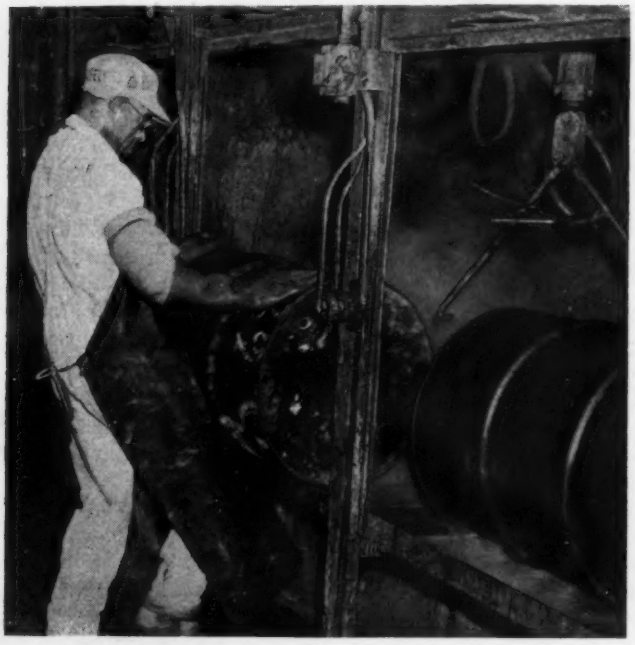
When grinding commutator surfaces, every reasonable precaution must be taken to prevent the fine copper and grinding-stone dust from being drawn into the windings of the machine. This dust easily penetrates insulation and can cause serious grounding or short-circuiting troubles.

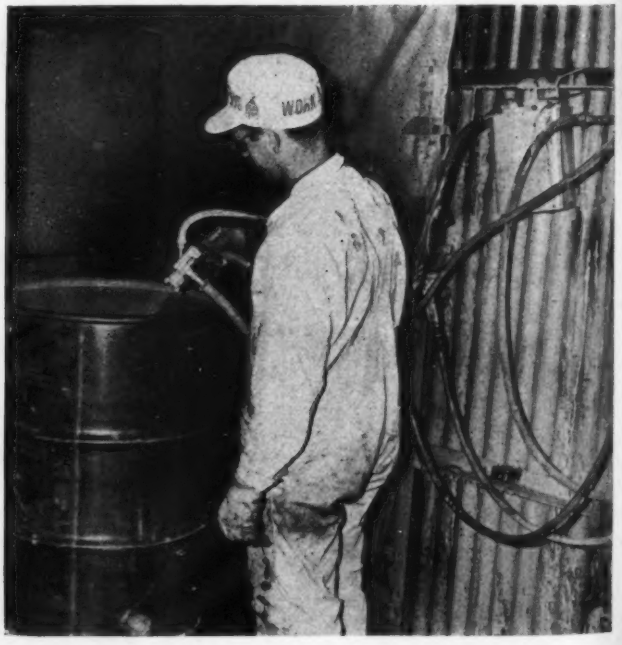
Before beginning the grinding job tie circular shields of fiber or cardboard to the commutator risers, to act as buffers in the air stream flowing over the commutator surface and thence into the machine armature and field windings. Although such baffles afford some protection against dust, they cannot be considered truly efficient and should be supplemented by other means of removing the dust.

Dust removal can be accomplished simply and efficiently by placing a vacuum cleaning nozzle close to the commutator surface, near the trailing edge of the grinding stone. When the machine being repaired is in a plant equipped with a central vacuum cleaning system the nozzle can be connected to a convenient vacuum outlet. But when such a system is not available, then a heavy-duty portable vacuum cleaner will serve the purpose. If, however, neither of these vacuum producers is available, a vacuum cleaning device similar to the one shown in the drawing can be easily assembled from standard pipe fittings.

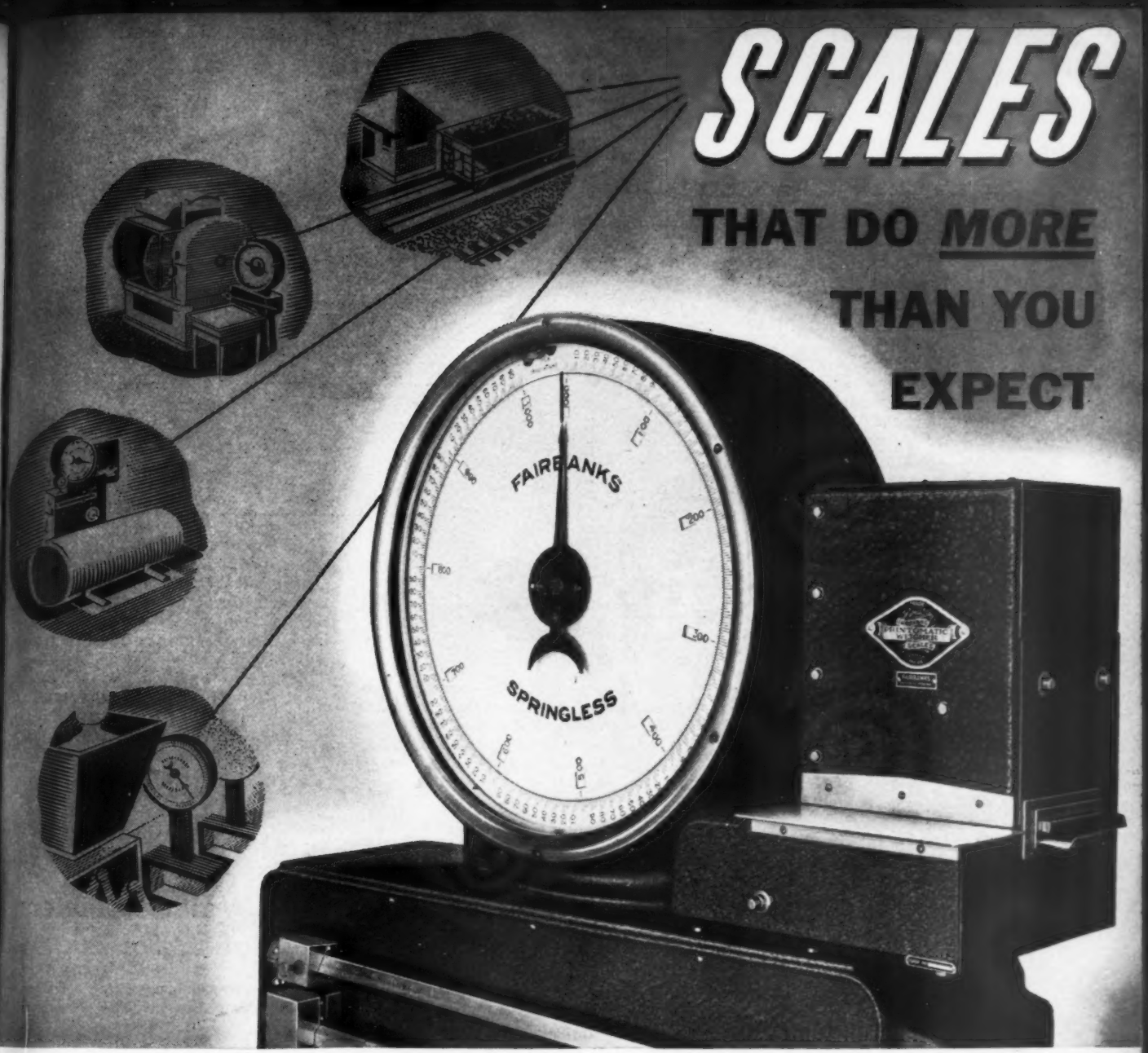


Following the grinding job, and before voltage is applied to the machine, all windings should be carefully gone over with the vacuum hose to remove any dust





Thousands of steel drums and barrels, which would be junked in normal times are being reclaimed under a reconditioning plan developed by the Chicago plant of the Sherwin-Williams Company. Drums are used for bulk shipments of camouflage paints for ships, tanks, and other ordnance finishes supplied to war plants throughout the country. Into a caustic solution go the drums (left), where they are rotated until bright metal reappears. Then they are sprayed with a protective enamel, which makes them gleam like new. This process is far more costly than using new drums, but many tons of metal are thus saved for war equipment



OF course, Fairbanks Scales are big, husky, and accurate. You have a right to expect these things in *any* good scale — and particularly of Fairbanks Scales with the world's broadest scale manufacturing experience behind them.

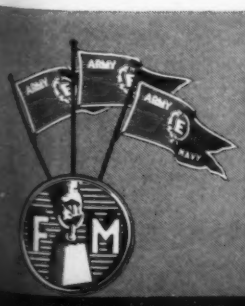
The feature about Fairbanks Scales that may surprise you the most, is their ability to do things you *don't* expect of scales.

Here are a few of many jobs done by Fairbanks Scales:

- They count small parts — more accurately than manual counting
- They weigh carloads of coal in motion and make a printed record of each weight
- They automatically control paint ingredients
- They automatically control aggregates
- They "keep the books" in steel plants, making printed records of incoming and outgoing shipments
- They keep accurate records on chlorination in water treatment
- They record the *flow* of liquid chemicals
- They guard secret formulas in compounding
- They control batching in bakeries
- They prevent disputes by eliminating the human element in weighing.

AND all of these things, only the beginning of the story, they do automatically and mechanically thereby eliminating human errors.

How Fairbanks Scales can be fitted into your production flow to speed up operations and eliminate errors may prove to be the most interesting discovery you ever made. Investigate now. Write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Illinois.



FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
SCALES

WATER SYSTEMS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS
RAILROAD EQUIPMENT

FAIRBANKS SCALES

Scales

that may have escaped the nozzle. After this cleaning the machine can be thoroughly blown out with compressed air without danger of drawing the dust into the insulation.

•

Dogs Trained for Plant Protection

SOURCE—Glenn L. Martin Co., Baltimore

Six dogs, "volunteered" from civilian life for military service and trained by the Army for defense work, have been assigned to sentry duty at the Martin plant.

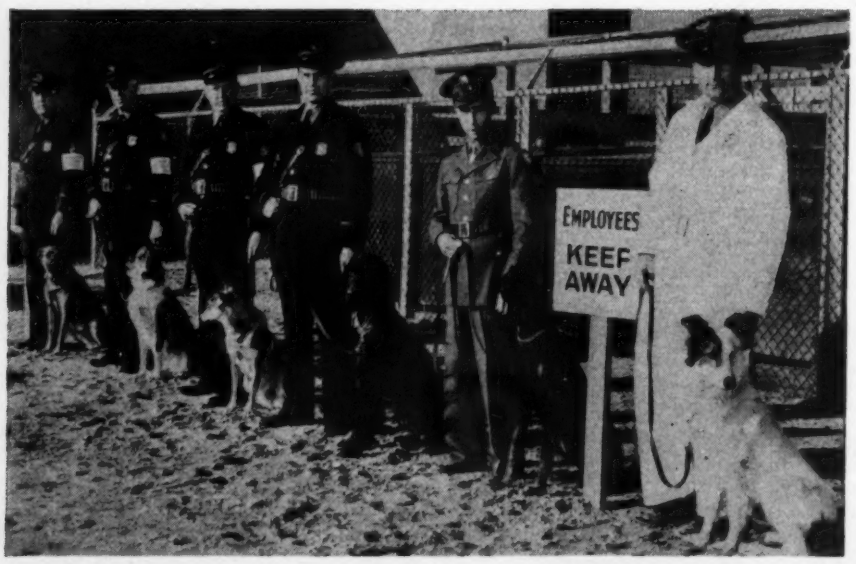
Contributed to the war effort by their respective owners in different parts of the country, the animals were mustered into service at the Army's dog-training center, Front Royal, Va., where they were given seven weeks of basic training to prepare them for the serious business of war.

As much a part of the Army as any doughboy or bombardier, the dogs were taught to obey orders instantly and absolutely. Then in a series of conflicts with trainers wearing well-padded suits, they learned to look upon all men as enemies, except the men assigned as "masters," who made comrades of them.

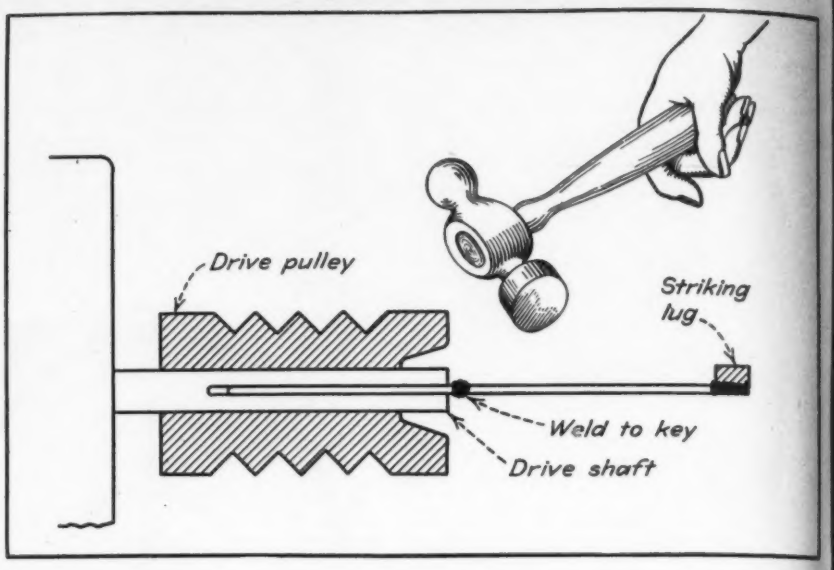
Considered ready for "action," the dogs were then transported to the Martin plant in the custody of an Army corporal.

After an introduction to the chief of the company's protection department, each dog was assigned to two "masters" from the department with whom to team as part of a roving patrol. Except for the kennel master, who will associate with them almost constantly when they are not on duty, the dogs will obey only their masters. Masters and dogs are not interchangeable.

The dogs, two female and four male, averaging 18 months of age, are of different breeds. Two are German shepherds, two are collies, one is an Irish water spaniel, and one a Dobermann pinscher.



Six alert dog "volunteers" trained by the Army for plant sentry duty



Tight Motor Keys Easily Removed

S. H. COLEMAN, Staunton, Va.

Sometimes it is difficult to remove pulleys from motors or shafts without damaging either the pulley or the shaft. When conventional methods of doing this job require the application of an undue amount of force, the trouble is likely to be caused by tightness of the key. A tight key may be the result of corrosion, insufficient clearance between it and the keyway when originally driven in, or distortion of the key or keyway due to mechanical strains imposed by the drive.

A simple method of pulling tight keys so that the pulley can be taken off the shaft without being harmed is shown in the drawing. A piece of bar stock, with a cross-sectional dimension nearly the same as that of the key, is welded to the exposed end of the key. Welded to the other end of the bar is a piece of iron or steel approximately 2 inches square and long enough to afford a strong weld. With this arrangement it is quite easy to back the key from the keyway by striking the block with a hammer or other convenient striking tool.

Length of the bar will, of course, depend on the size of the hammer required to move the key. However, it should always be long enough to preclude any possibility of the hammer's striking the pulley face. With very long bars, the striking end should be supported by blocking or other means to keep it level with the keyway.

•

Uses Watthour Meters on Plating Tanks

SOURCE—Westinghouse Electric & Manufacturing Company, East Pittsburgh

By using an ordinary watthour meter, instead of an ampere-hour meter, to provide accurate control of current in electroplating permanent magnets, we have reduced cost per meter and eliminated expensive and cumbersome shunts across the plating electrodes.

The watthour meter is connected to the alternating current side of a rectifier, such as used to supply direct current for electroplating. A contact on the register closes after a predetermined amount of energy has passed through the meter and operates a circuit breaker which opens the plating circuit when the desired thickness of deposit is attained. Since the voltage of the alternating current is substantially constant, no special ampere-hour meter or timing device is necessary to obtain accurate results.

The watthour meter may be placed on a switchboard some distance away from the plating tank. Use of an ampere-hour meter made it necessary to place the shunt near the plating tank. This arrangement took up valuable space. Also, it was necessary to protect the shunt and the leads from the plating solution and the fumes arising from it.

Trade Marks "ScotTissue," "Soft-Tuff," "Washroom Advisory Service" Reg. U. S. Pat. Off.

THE MISSING MAN

Fight contagions with sanitary, modern washrooms

THE plant washroom has become vitally important in today's race for production. It can help prevent the spread of sickness—and sickness is keeping over one million workers off the job. Sickness is robbing you of a week's production every year.

Over half of this loss is due to the common cold and its complications . . . to the ordinary kinds of illness that spread quickly from hand to mouth, from worker to worker.

A well-designed, modern washroom encourages your workers to wash up frequently, especially before mealtimes. Thus a strong barrier is erected against the common contagions.

Many companies have found, too, that attractive washrooms pay important dividends in employee good-will.

When designing or remodeling a washroom, consult a competent architect. He knows how to make it cheery and sanitary . . . easy to maintain. He will plan for smooth traffic flow. He will arrange fixtures for the greatest convenience, and to prevent waste of supplies.

THE SCOTT WASHROOM ADVISORY SERVICE

For a complete survey of your washroom facilities, call on the Scott Washroom Advisory Service. It may be able to point out many ways to increase hygiene, efficiency and comfort.

If you supply ScotTissue Towels, it will suggest ways to prevent waste, so that other companies can share the supply. Our educational material reminds workers that *one* ScotTissue Towel dries completely.

Actually, a "Soft-Tuff" ScotTissue Towel can absorb double the water left on hands. And it has ten times the rub strength of previous ScotTissue Towels, though soft as ever.

We invite you to send for our portfolio, *Health Is Ammunition, Too* —proven aids for establishing a good industrial health program.

Scott Paper Co., Chester, Pa.

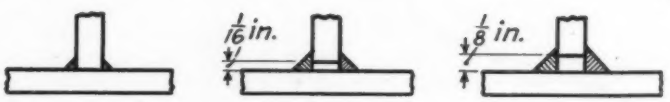
SCOTTISSUE TOWELS
STAY TOUGH WHEN WET

Conserve Welding Electrode

Welding electrode is a most essential material in war production. Conserve it by controlling the factors that affect its best utilization

1. Select the right type of joint (see Data Sheet No. 40, FACTORY, June, 1941)
2. Be careful of fit-up
3. Choose correct type of electrode
4. Use electrode that has and maintains a uniform coating
5. Use electrodes that provide proper physical properties
6. Use fast-flowing electrodes wherever it is possible
7. Select an electrode that keeps splatter and slag loss at a minimum
8. Use electrodes that produce flat beads
9. Select electrodes of the right size
10. Use long electrodes in the larger sizes
11. Do not bend electrodes
12. Use proper voltage and current settings
13. Follow procedure specified for the type of electrode
14. Avoid using an excessive number of beads
15. Use electrode down to minimum stub
16. Collect and save stubs of electrodes
17. Use high-capacity welding generator of modern design

Accurate Fit-Up Conserves Electrode



Gap between plates—inches	0	1/16	1/8
Pounds deposited per foot of joint	0.40	0.58	0.80

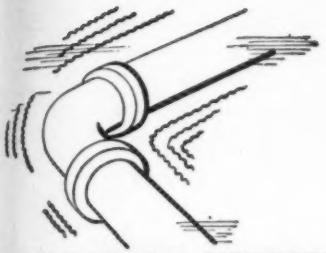
Effect of Various Electrode Sizes

Electrode size (inches)	1/8	5/32	3/16	1/4	5/16	3/8
Amperes	110	130	150	250	325	425
Arc volts	24	25	26	30	34	38
Kilowatts at arc	2.64	3.25	3.90	7.5	11.1	16.1
Consumption (pounds per hour)	2.6	3.3	3.95	7.5	10.7	16.2
Deposit—50 percent operating factor (pounds per hour)	0.87	1.1	1.32	2.5	3.57	5.4
Efficiency of set	0.47	0.50	0.51	0.55	0.59	0.59
Kilowatts input	5.6	6.5	7.65	13.65	18.8	27.3
Interruptions or stubs per pound consumed	18	12	8	5	3	2

Prepared by CLAYTON B. HERRICK, Welding Engineer, Lincoln Electric Co., Cleveland

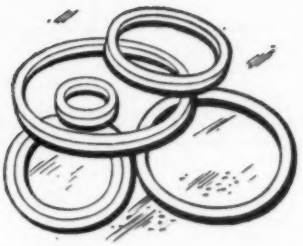
How to eliminate these piping troubles that hamper war work:

Weld with TUBE-TURN WELDING FITTINGS



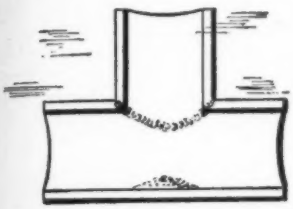
VIBRATION EFFECTS

You need never worry about vibration or strain loosening a *welded* joint.



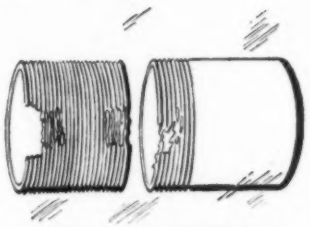
GASKET CHANGES

Fewer flanged joints mean less gaskets—save materials and time.



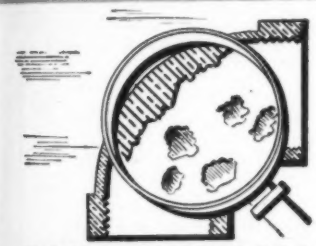
SLAG ACCUMULATION

Butt welds with Tube-Turn fittings virtually eliminate danger of slag.



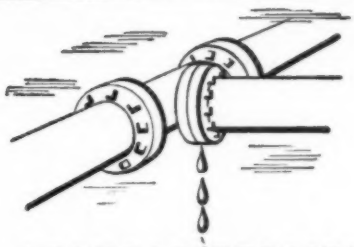
WORN THREADS

Threading thins and weakens metal—causes failures.



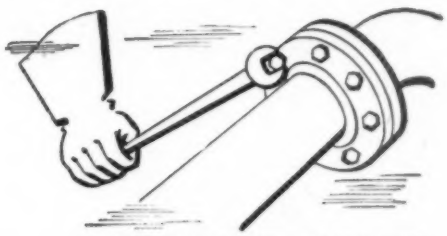
RAPID CORROSION

Tube-Turn fittings resist corrosion because of better metal structure.



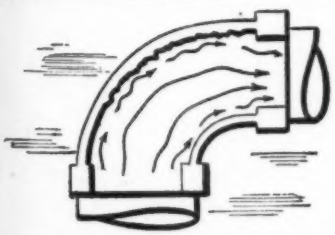
LEAKAGE REPAIRS

No chance of loose connections or leaks with Tube-Turn fittings.



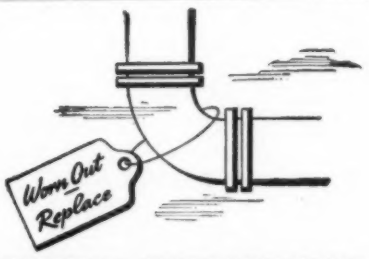
LOOSENED BOLTS

The more welding fittings used, the fewer bolts there are to tighten.



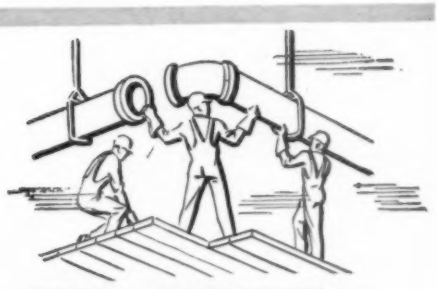
INEFFICIENT FLOW

Easy sweeping radius and no offsets inside mean less pressure loss.



FITTING REPLACEMENT

There's far less time loss or replacement expense with Tube-Turn welding fittings.



SLOW INSTALLATION

Tube-Turn fittings line up perfectly; allow fast, simple, easy butt welding.

NO. 3 OF A SERIES

HOW TUBE-TURN WELDING FITTINGS BENEFIT WAR INDUSTRY

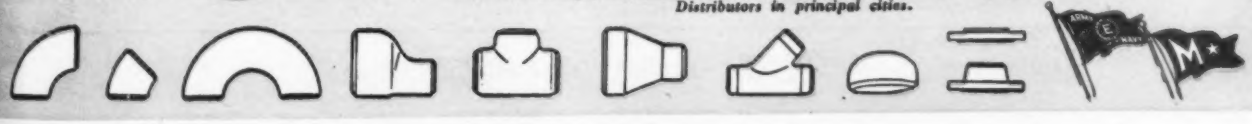
The ★ FIRST WELDING FITTINGS 1ST AND STILL THE BEST

TUBE-TURN

TRADE MARK

Welding Fittings and Flanges

TUBE TURNS (INC.) LOUISVILLE, KY. *Branch offices:* New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Dayton, Washington, D. C., Tulsa, Houston, Los Angeles. *Distributors in principal cities.*



Recommended Arrangements for Pneumatic Tools

A chart for use in determining suitable hose arrangements for any pneumatic tool is shown below

TO USE THIS CHART, find the rate of flow—left-hand column—comparable to the air consumption at maximum horsepower of the tool to be used. Follow across the page horizontally and select the acceptable pressure drop for that tool. Suitable hose arrangements are indicated at the head of the columns. Pressure drop below (that is, greater than) the values which are indicated by a heavy line immediately beneath them, are relatively high and will result in a correspondingly high reduction in the power delivered by the tool.

Air flow cubic feet per minute	10 ft. of 1/4-in. hose	8 ft. of 5/16-in. hose	10 ft. of 3/8-in. hose	12½ ft. of 1/2-in. hose	25 ft. of 1/2-in. hose	50 ft. of 1/2-in. hose	12½ ft. of 3/4-in. hose	25 ft. of 3/4-in. hose	50 ft. of 3/4-in. hose	50 ft. of 1/2-in. and 10 ft. of 1/4-in. hose	50 ft. of 1/2-in. and 10 ft. of 3/8-in. hose	50 ft. of 1/2-in. and 8 ft. of 5/16-in. hose	50 ft. of 1/2-in. and 12½ ft. of 1/2-in. hose	50 ft. of 3/4-in. and 25 ft. of 1/2-in. hose	50 ft. of 3/4-in. and 12½ ft. of 3/4-in. hose
Pressure Drop — pounds per square inch — based on 100 pounds per square inch line pressure															
10 to 11	5.0	.9								5.3	.7	1.4			
11 to 12	5.9	1.0								6.2	.8	1.6			
12 to 13	6.8	1.2	.4							7.2	.9	1.9			
13 to 14	8.0	1.4	.5							8.4	1.1	2.2			
14 to 15	9.3	1.6	.6							9.8	1.3	2.5			
15 to 16	11.0	1.9	.7							11.6	1.5	2.9			
16 to 18	14.0	2.4	.8							15.0	1.9	3.5	1.7		
18 to 20	19.6	3.0	1.0							21.4	2.4	4.5	2.0		
20 to 25		4.3	1.4	.7	1.0	1.3					3.5	6.4	2.6	1.3	
25 to 30		6.6	2.1	1.0	1.5	2.3					5.2	9.8	3.8	1.9	
30 to 35		9.5	3.1	1.3	2.1	3.6					7.3	13.7	5.3	2.6	
35 to 40		12.8	4.2	1.7	2.8	5.2					9.6	18.4	7.1	3.5	
40 to 50		19.3	6.3	2.4	4.1	8.0					14.0		10.4	5.2	1.8
50 to 60			9.6	3.7	6.3	12.2					21.8		16.0	7.8	2.3
60 to 70			13.5	5.3	9.0	17.4	.9	1.4	1.9				22.8	11.1	3.0
70 to 80			18.7	7.1	12.4		1.1	1.7	2.5					15.0	3.7
80 to 90			25.0	9.0	16.1		1.4	2.2	3.2					19.8	4.6
90 to 100				11.1			1.7	2.7	4.0						5.8
100 to 120							2.3	3.5	5.6						7.9
120 to 140							3.2	4.8	8.0						11.2
140 to 160							4.3	6.6	11.0						15.5
160 to 180							5.6	8.7	15.2						20.4
180 to 200							7.2	11.0							
200 to 220							9.0								

Air pressure at a pneumatic tool determines the power the tool will develop. The average air tool requires about 90 pounds pressure at the inlet. A larger loss in pressure is apt to result from the use of improper hose. Changing the hose to conform with the chart will restore power and speed to the tool. It is assumed that the connection from compressor to hose is adequate to deliver the required air to the hose at proper pressure.

Prepared by C. W. GIBBS, Engineer, Ingersoll-Rand Company, New York

ONLY AN ELECTRICAL WHOLESALER COULD THUS SPEED WAR PRODUCTION

Emergency airfields glowed 52 days earlier

Wesco Made Special Light Standards and Shipped "Floods" to Icy Coast in 18 Days

A large airlines company was in dire need of sixteen 500 watt floodlights and portable, adjustable, special standards for lighting emergency landing fields in the foul weather of the frigid Northwest Coast. For 5 weeks an order had been placed with the manufacturer of the equipment. Word then came of a minimum 5 more weeks before delivery. The airlines company appealed to Wesco for help.

The local Wesco House responded at once—arranged for special floodlight standards and bases, supervised the necessary tapping, drilling and other machining, selected the floodlights from its own large stocks and started the entire shipment on its way North in 18 days.

The aptitude of Wesco men to render emergency services beyond the scope of routine duty is no accident. It is the result of years of training, experience and initiative. Now devoted to winning the war, Wesco's "know how" will be at the command of industry and commerce when peace returns to the world.

WESCO SPEEDS PRODUCTION

* A special heat-treating oven was needed immediately by a tank builder. With Wesco's aid, an oven was designed, built, wired, and on the job in 48 hours.
* Synthetic rubber plant gets needed material in 3 days from Wesco. Delivery from manufacturers meant a six to ten weeks delay.

WESCO SERVES BUSINESS

* By warehousing stocks in anticipation of customers' needs.
* By furnishing informative and technical data.
* By providing trained sales and engineering personnel.

Westinghouse Electric Supply Co.

150 VARICK STREET • • • NEW YORK, N.Y.

A NATIONAL DISTRIBUTING ORGANIZATION WITH 80 BRANCHES

FRONT-LINE mobile Machine Shops...

For tank repairs under fire...

For rebuilding damaged planes, guns and motorized weapons...

It's the job of American Industry to produce and equip all the Mobile Machine Shops needed to keep the Army at peak efficiency.

It calls for round-the-clock production in thousands of war plants producing welding tools, lathes, valve grinders, other garage equipment.

These plants need the finest heating equipment that America can provide... for proper heating is essential to maximum output.

Steam, harnessed and brought under control with Webster Systems of Steam Heating, has proved its ability to provide comfort, economy and trouble-free operation.

Today, we are engaged in direct war work, but manufacturing facilities are still available to supply Webster Steam Heating Equipment for buildings serving the war effort.

Essential repairs for Webster Systems are available under W. P. B. Order P-84.

Warren Webster & Company, Camden, N. J.
Representatives in principal U. S. Cities

ARMY E NAVY
Webster
Steam Heating

YOU WANT TO KNOW

more about the items mentioned on this page

Letters to the addresses given will bring information

• FOR THOSE INTERESTED in knowing what is being done in the way of research in the field of business and economics, the United States Department of Commerce, Washington, D. C., has put out its third annual "Survey of Business Research Projects at Universities." It is a compilation of economic studies recently completed or in process in universities, colleges, and research institutes.

• TO SIMPLIFY the time and motion study job, a 6-in. rule has been designed. At one end, process chart symbols are cut for use as patterns. At the other end, motion elements are listed on the front; on the back appear the 24 principles of motion economy. Blue lettering on white. 25c. The Institute of Motion Analysis, P. O. Box 116, Newark, N. J.

• MOTOR RECORD CARD for maintenance engineers is available free from the General Electric Company, Schenectady. When essential information is filled in about the motor, inspection, and repairs, this card-chart gives complete history of each motor. Keeps a check on motor breakdown causes and costs. Convenient 4x6-in. file size.

• INCOME TAX PROBLEMS? A little booklet called "Understanding Your Income Tax" covers, in brief, fundamental points on paying income tax. Step-by-step procedure for filling out and filing a return, full explanation of all authorized deductions, and Victory Tax withholding table are included. Booklets may be secured from George Douglas, Secretary, Committee on Government Finance, National Association of Manufacturers, 14 West 49th St., New York, at $4 per 100 or $3 per 100 for 1000 copies and over.

• "C-MASTER" INSPECTION TOOL with "1000 angles" is for use in looking into inaccessible places. A small mirror and an adjustable angles device does the trick. Model K, which folds up and slips into the pocket, has a 10½-in. handle. Model M has a small magnetic base by which it can be attached to any metallic machine part for stationary use. The frame is durable, rustproof. Mirror refills are available. Ulman Products Co., 857-861 Fourth Ave., Brooklyn, N. Y.

• SHIFT-O-GRAPH simplifies the rotating shift problem. Twirl of a disk brings to view a plant's shift set-up for any week in the year. Weeks are scaled and numbered on the calendar. Crews go by color. Week number in question is rotated to segment titled "This Week." Color bars falling opposite shift numbers as the disk is set show each crew's working days and the shift set-up. Distributed free by George S. May Co., May Building, 2600 North Shore Ave., Chicago.

VICTORY VU-KIT for the box lunch not only saves metal but is lightweight, easy to open, easy to clean. Made of Lumarith plastic, a product of Celanese Celluloid Corp., it is not supposed to dent or chip. About 10x7½ inches, the kit holds thermos bottle, man-sized sandwiches, dessert, etc. Passes inspection at a quick glance. Designed and produced by V. W. Busch Manufacturing Co., South Lyon, Mich.

• "HELLO AND WELCOME" is the greeting in booklet form that Simmonds Aerocessories, Inc., 21-10 Forty-Ninth Ave., Long Island City, N. Y., gives to its new employees. Facts about the company, payday, overtime, attendance, restrooms, holidays, safety—any question the new employee may have is outlined in this brief little handbook to make him feel at home more quickly.

• IMPREGNATED FELT called "Thiokol" is being produced as an alternate for rubber and synthetic rubber materials. Specially processed, the felt has a weather-resistant surface and is similar to dense sponge rubber or soft molded rubber. Can be used as sealing strip or gasket material. Weighs about 14 pounds per 1000 cu. in. Dark gray or black, it comes in die-cut pads or strips. Automotive Rubber Co., Dept PE-8601, Epworth Blvd., Detroit.

• SPIRAL-WRAPPED PAPER TUBING or cores, claimed to have greater strength, closer tolerance, and wider range of sizes,

OIL FEVER CURED

SOLNUS OILS

Reduce Temperatures 15° to 20° F. . . . Eliminate Sludge

In one of the country's best known paper mills, a circulating oil system services five huge paper machines. Sludge and high temperature of the oil in this system had been a constant source of bearing trouble.

Adopting the recommendation of a Sun "Doctor of Industry," the lubrication engineer of this company changed to Sun Solnus Oil. Immediately, temperatures were reduced 15° to 20° F. . . . sludge formation was eliminated. After two years of continuous use, the Solnus Oil in the system was analyzed and proved to be in satisfactory condition for continued use.

Following their highly successful experience with Sun Solnus, this plant has switched to Sun Lubricants for use throughout the mill . . . for all bearings . . . on the wet end of all paper machines . . . in the machine shop . . . for many other purposes.

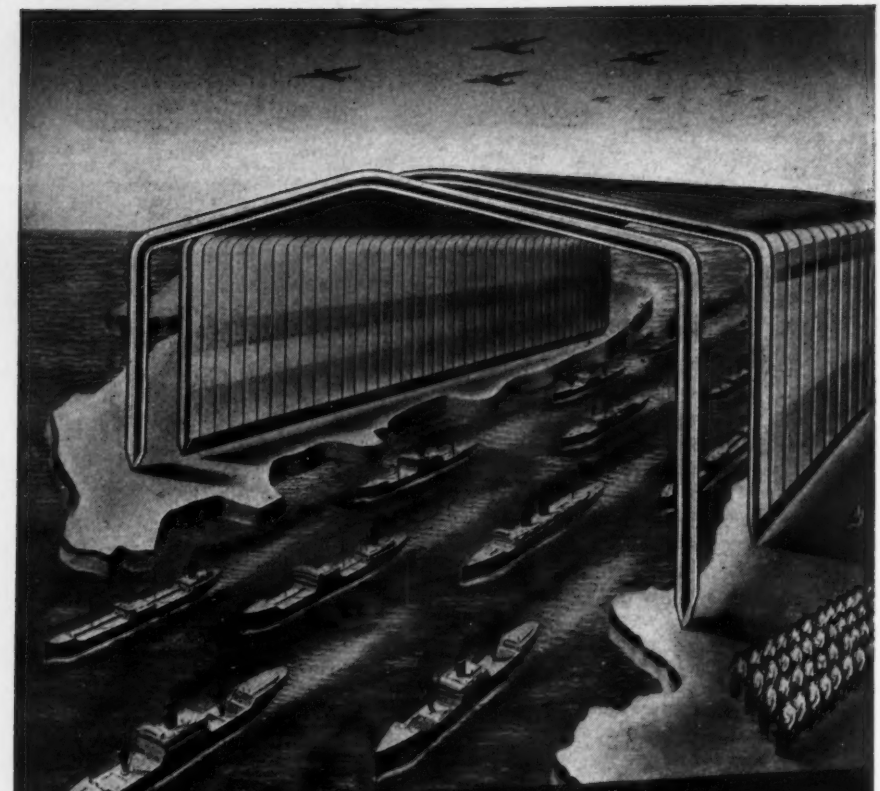
This is typical of what the right Sun Lubricants in the right places can do for you . . . are doing, in hundreds of plants, to speed war production, minimize machine wear, save expensive and time-consuming repairs and replacements. Call in a Sun "Doctor of Industry" for consultation. Let him help you to lick your tough lubrication problems . . . to obtain maximum performance from your machines.

SUN OIL COMPANY, *Philadelphia*

Sun Oil Company, Limited . . . Toronto, Canada

SUNOCO

IN PETROLEUM PRODUCTS HELPING INDUSTRY HELP AMERIC



What's This Little Bostitch Staple Doing on Convoy "X"?

THE CARGO bristles with Bostitching (machine-applied stapling) drafted for the war . . . for SPEED!

Speed in shaping ammunition belts for our soldiers to feed their guns . . . in assembling plastic scabbards for their bayonets . . . in steel-stitching parts for planes and tanks they will ride . . . in linking portable landing fields and emergency roadways . . . in the equipment that protects their ships against magnetic mines . . . in hundreds of other applications newly created for war purposes . . . in thousands of applications regularly used on civilian products but now enrolled in war service!

These wartime uses are further evidences that "Bostitch fastens it better, and faster, with wire." Meeting war production challenges is also creating new and improved Bostitch tools and applications for future use . . . nearly 800 Bostitch models and types make possible the right combination of machine and staples for each particular job.

If you have the necessary priorities, find out *now* if Bostitching can help speed your production . . . if priorities are not available, investigate Bostitching *now* so that you can apply these advantages and improvements immediately to quick post-war adjustments and production.

Bostitch, (Boston Wire Stitcher Company) 72 Blackmore Street, East Greenwich, R. I. (Bostitch-Canada, Ltd., Montreal).

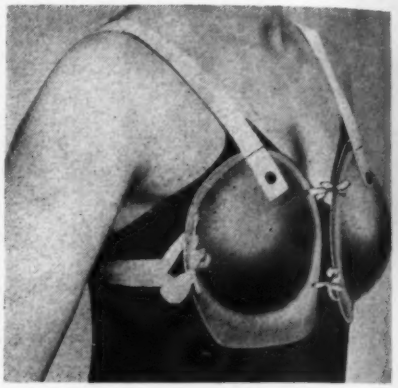
BOSTITCH

fastens it better, AND FASTER with wire

ALL TYPES OF STAPLES APPLIED BY MACHINES
ALL TYPES OF MACHINES FOR APPLYING STAPLES

MOTORIZED STAPLER 1 of the 800

are available. The paper tubes can be supplied in high dielectric kraft, fish paper, red rope, acetate, or combination wound in square, round, or rectangular shapes and continuous lengths. Sizes vary from $\frac{1}{8}$ inch square to 4 inches square inside with a tolerance as close as 0.002 inch. Paramount Paper Tube Co., 800 Glasgow Ave., Fort Wayne, Ind.



MOLDED VULCANIZED FIBER breast protectors have been designed for the protection of women war workers. Extended ledges at the bottom of the cups provide a base to resist harmful blows. The protectors are worn over slip or brassiere and come in flesh color in three sizes. The light web harness, adjustable in the back and between cups, can be detached and laundered and the cups sterilized. Available from the Strauss Co., 875 Ewart Bldg., Liberty Ave., Pittsburgh

• DUREZ 7421, a liquid phenolic casting resin for metal forming dies, jigs, and fixtures, has been announced. It is a thermosetting material which sets by baking at 100 degrees Centigrade. By using an accelerator, lower temperatures can be used. At 140 degrees Fahrenheit, baking time takes two to four hours. Shrinkage at this heat is 0.003 after a two-hour bake. Compressive strength runs 15,000 to 20,000 pounds per square inch. Durez Plastics & Chemicals, North Tonawanda, N. Y.

• VEGIMAL is the name for a new adhesive made with vegetable base. Claimed to adhere permanently combinations of papers, cardboards, fabrics, leathers, and imitation leathers, it is applicable by machine or hand brushing, by spreader, or dipping. Running 10 pounds per gallon, 1-gal. jars, 5- and 10-gal. kegs, and 30- and 55-gal. drums are available. Paisley Products, Inc., 1770 Canalport Ave., Chicago.

• WARTIME CONSERVATION of critical materials and how to get more production from present equipment. "Wartime Conservation" shows how to accomplish these results in 96 pages of pictures and text. Illustrations are unusual and effective; text is written in simple, easy-to-understand language; charts are used throughout to clarify the principles involved. Edge-indexed for easy reference. Available without charge from Westinghouse, East Pittsburgh.

PLUG IN "HOT"

. . . with Safety!

This man is working less than six inches from "hot" busses carrying 440 volts. Yet he makes his "tap" for a new machine in perfect safety.

The moment the plug is placed against the Bus Duct casing, it is grounded. As the projecting "fingers" are pushed through the plug-in opening they automatically clamp over the "live" bus bars within — and the connection is complete. At no time can the workman touch current-carrying parts.

Many hundreds of new branch circuits must be hooked up in the nation's war plants every day—and hooked up quickly. Where a safe, enclosed bus duct system is used, the job can be done without jeopardizing the lives of skilled workmen or halting production.

Bus Duct protects against fire and sabotage. It requires little or no maintenance. And in BullDog's Victory Model, it conserves the greatest amount of critical materials consistent with sound engineering.

BUY MORE WAR BONDS • SALVAGE ALL SCRAP METAL

Send for descriptive Bulletin No. 427

BULLDOG
ELECTRIC PRODUCTS CO.
Detroit, Michigan

BullDog Electric Products of Canada, Ltd., Toronto, Ontario

Field Engineering Offices in All Principal Cities

MANUFACTURERS OF Vacu-Break Safety Switches, SafToFuse Panelboards, Circuit Master Breakers, Switchboards, Bus Duct Systems — FOR LIGHT AND POWER

Safety Goggles
FOR EVERY OCCUPATION

There are Bausch & Lomb Safety Goggles designed to meet the specific conditions created by different occupations. By meeting those specifications B&L Safety Goggles increase workers' efficiency while providing maximum protection against eyesight hazards.

These safety goggles are available in sizes to fit any worker—in types best suited to every job—in clear, Ray-Ban or Arc-Ban Glass, whichever conditions indicate. Bausch & Lomb Optical Company, 650 St. Paul Street, Rochester, N. Y.

A partial list of applications for Bausch & Lomb Safety Goggles

- Acetylene Cutters and Burners
- Acetylene Welders
- Acid and Caustic Handlers
- Aluminum Welders
- Brazers
- Buffers
- Bus Drivers
- Cement Plant Workers
- Chippers
- Circular Saw Operators
- Construction Workers
- Cranemen
- Dippers
- Drill Press Operators
- Drillers
- Dust Workers
- Electrical Workers
- Explosive Plant Workers
- Factory Instructors
- Firemen
- Flour Mill Workers
- Forgemen
- Foundry Workers
- Furnacemen
- Galvanizers
- Grain Elevator Workers
- Grinders
- Hand Tool Workers
- Heat Treating Workers
- Jointer Operators
- Ladle Men
- Linemen
- Machinists
- Melters
- Miners
- Mixers
- Office Workers
- Painters
- Picklers
- Plant Supervisors
- Platers
- Pneumatic Drill Operators
- Polishers
- Pourers
- Quarrymen
- Railroadmen
- Riveters
- Rollers
- Sand Blasters
- Scalers
- Scarfers
- Scrapers
- Setup Men
- Shaper Operators
- Shipping Clerks
- Shipyard Workers
- Spot Welders
- Sprayers
- Steam Boiler Operators
- Steel Blowers
- Stone Dressers
- Supervisors
- Tappers
- Trainmen
- Truckers and Helpers
- Welders
- Welders' Helpers
- Welding Setup Men
- Wreckers

Remember that Bausch & Lomb Safety Goggles can be supplied with lenses ground to any individual prescription!

BAUSCH & LOMB
Safety Goggles

SAVES MANPOWER!

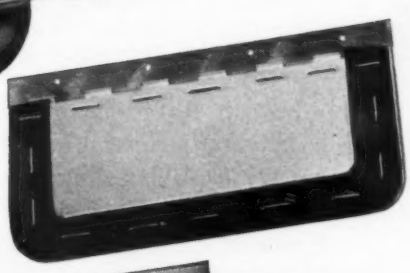
EVERY DAY the saving of manpower in aircraft assembly becomes more important. So it is only natural that aircraft manufacturers are fast turning to Morrison Stitchers which consistently *save hundreds of man-hours per week per machine* in assembling Aluminum, Stainless Steel, Plastics, Rubber, Cork, Asbestos, Wood, Canvas, etc.

How does this revolutionary new method of assembling stand the gaff? Impartial laboratory research tests give the answer by proving higher strengths and longer life for Morrison-stitched assemblies in a great variety of applications and with an amazing number of different materials.

Investigate the possibilities for *your* fabrication. For complete information on this fast, versatile, proven method, write us on your letterhead for Bulletin No. 9 on the Morrison Aircraft Stitcher.

Model SJR 25" Throat Arm Stitcher

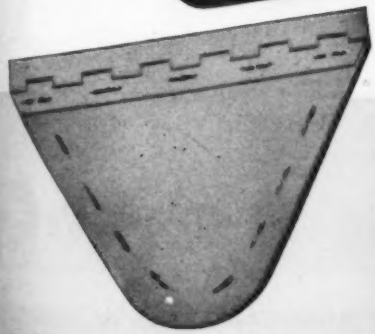
Actual photograph of strips of .040 24ST aluminum, life size, bonded by the Morrison Stitcher. Saw-cut through row of stitches shows remarkable bond and stitch uniformity.



Rubber stitched to .040ST Aluminum

.032ST Aluminum stitched to linen fabric

Fabric stitched to .040ST Aluminum

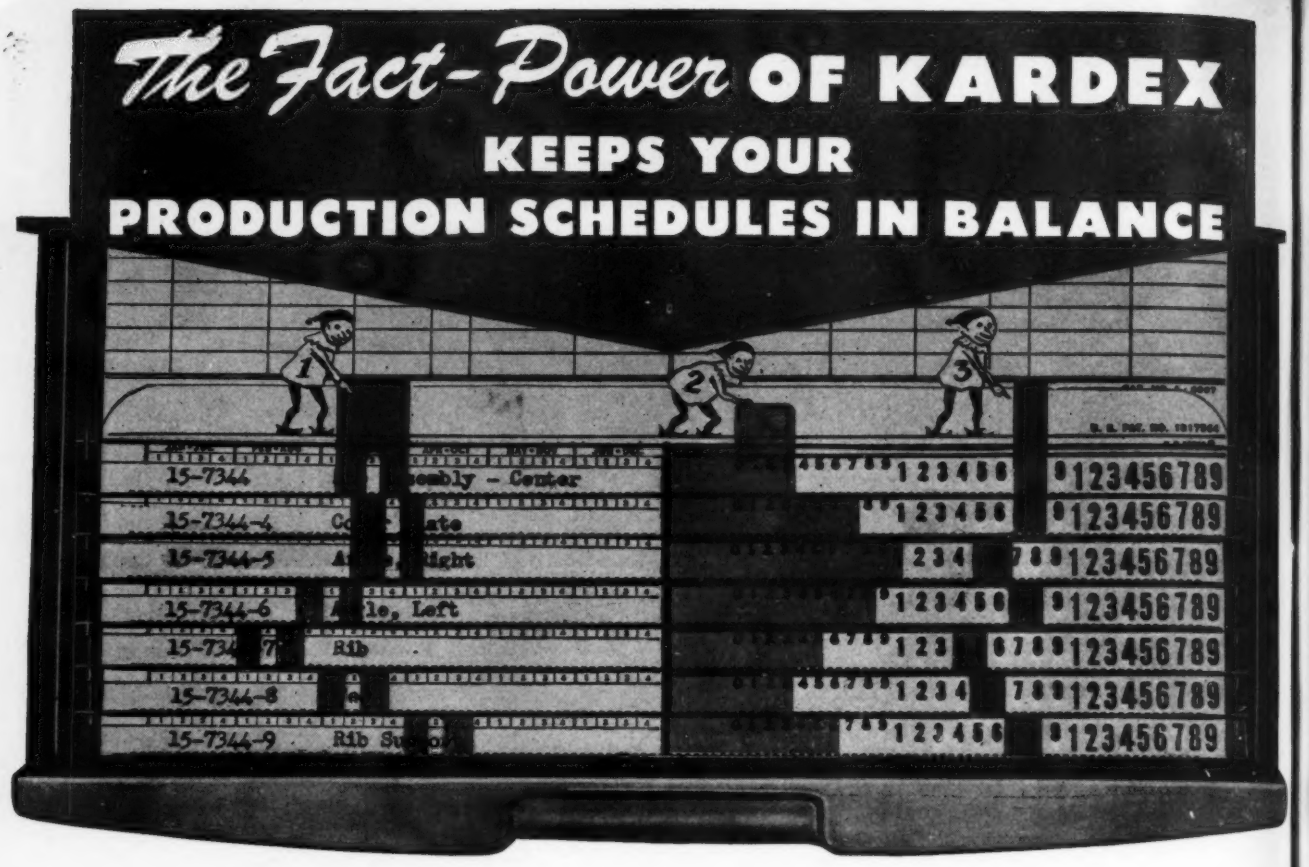


.040ST Aluminum stitched to .032ST Aluminum

MORRISON STITCHERS

PRODUCTS OF THE SEYBOLD DIVISION
HARRIS-SEYBOLD-POTTER COMPANY
DAYTON, OHIO

The Fact-Power OF KARDEX KEEPS YOUR PRODUCTION SCHEDULES IN BALANCE



FOR MAXIMUM OUTPUT PER MACHINE AND PER MAN-HOUR

Rx USE KARDEX. Kardex is the only visible record system with exclusive Graph-A-Matic signal control . . . the "moving finger" that gives you an instantaneous picture of *your* business, as fresh as the latest news bulletin. Kardex gives you the "fact-power" you need for making fast, accurate decisions. Kardex is the administrative control system now on the job in thousands of war plants, including two out of every three winners of the Army-Navy "E" Award for production excellence.

Kardex summarizes vital information for the time-pressed executive—tells you *what* action is needed, and *when* to take it. Kardex may help speed *your* war production, for here is the fastest, most efficient solution to *every* control problem you're facing today... materials, production, inventory, procurement, machine load, personnel.

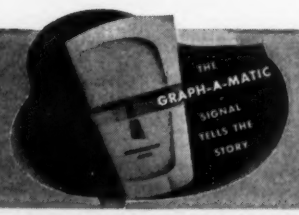
Rx USE KARDEX FOR PRODUCTION SCHEDULING. Here's how one war plant maintains balanced stocks of *every single part* needed to meet rigid production schedules:

MATERIAL PROCUREMENT. Any signal on or behind the current week indicates that material delivery or production is "bottle-necked" somewhere—flashes the need for expediting action.

PARTS AVAILABLE. The Graph-A-Matic signal insures a *balanced* flow of parts—charting (in tens, hundreds or thousands) the number of assemblies which can be produced from parts manufactured to date. Signals which "lag behind" the others indicate orders which require urging.

SCHEDULED REQUIREMENTS. This signal shows the total number of assemblies which can be produced from orders actually in process.

The Remington Rand Systems and Methods Engineer in your vicinity can give you expert technical advice on installing control methods to meet every problem. Phone him today, or write Systems Division, Remington Rand, Buffalo, N.Y.



FACT-POWER . . . . exclusive with Kardex, means vital facts are *signalled* for instant selection, assuring prompt and accurate administrative action.

REMINGTON RAND

CENTURY FORM J MOTOR

Protection Against Falling Solids and Dripping Liquids

The top half of the motor is closed. Cooling air enters at both ends and is discharged below the shaft line.

The upper half of the Century Form J general purpose, open, continuous duty motor is closed to minimize the possibility of dripping liquids or falling solids entering the vital parts of the motor.

This added protection feature is made possible because of the scientifically designed Century mechanical ventilation system. All motors generate heat, so if the insulation is to have long life, the heat must be rapidly carried away from the windings. Two powerful fans located behind each bearing bracket draw cooling air "IN" through the bearing bracket openings. This cooling air is deflected first around the bearings to keep them cool and then across the windings and to air passages between the outer surfaces of the magnetic core and the frame—the heated air being finally discharged "OUT" through the openings located at the sides and bottom of the frame.

These modern, protected, industrial, general purpose motors meet the requirements of more than 80% of all polyphase motor applications. This Form J construction is at present available in 2 to 15 horsepower four-pole frame sizes.

Your Century Motor Specialist has full information and his wide experience may well prove valuable to you. We suggest you call him in today.

Century MOTORS

Help You Beat the Production Promise

CENTURY ELECTRIC CO., 1806 Pine St., St. Louis, Mo.

Offices and Stock Points in Principal Cities

318

One of the Largest EXCLUSIVE Motor and Generator Manufacturers in the World.

"SEE-ABILITY" saves critical

AMERICAN industry has been accustomed to an abundance of metals. A little wasted was not serious.

Today the situation is different. We need to turn out finished products not only faster but with *less waste.*

Fortunately, much of the waste in manufacture can be avoided by applying the principles of good light. The "SEE-ABILITY" which good light provides makes for more accurate workmanship, permits greater care in check-ups and inspections, substantially increases the speed of production for our war effort.

Good lighting comes not only from properly installed equipment—but also from proper maintenance. A new book—"SEE-ABILITY FOR INDOOR EYES," published by Westinghouse describes many of the ways of getting more light from present equipment. For a copy, please write. Westinghouse, Lamp Division, Dept. F, Bloomfield, New Jersey. Your local power company will also be glad to help you with your lighting problems.

The heart of good lighting is the lamp. To maintain your lighting equipment at peak efficiency, use Westinghouse Mazda Lamps. They stay bright from end to end, have a longer life, and cost less today than ever before.

Westinghouse

★ MAZDA LAMPS ★

FOR GREATER "SEE-ABILITY"

A noisy bearing means trouble . . . usually indicates early failure. Why not prevent noise? Insure smooth QUIET operation by installing Johnson LEDALOYL—the ideal self-lubricating bronze bearing.

Evenly distributed over all surfaces of every LEDALOYL bearing are millions of tiny, evenly spaced pores. Each pore serves as an oil reservoir. When the shaft turns, a thin, protecting film of oil covers the entire bearing area. This is why Johnson LEDALOYL bearings operate so quietly, so efficiently and for such a long period of time.

Why not try LEDALOYL on your next application? Write today to—

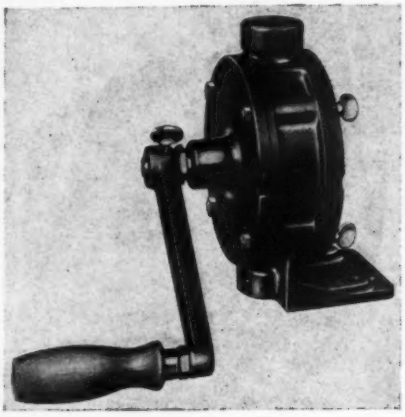
JOHNSON BRONZE
Sleeve Bearing Headquarters
512 S. MILL ST., NEW CASTLE, PA.

Specify **JOHNSON BRONZE**

WHAT'S NEW IN EQUIPMENT

Rotary Hand Pump

Basic design of hand pump follows the sliding vane principle. The base is fitted with an offset flange, which permits mounting on the edge of any flat surface and provides ample clearance for operation of the crank. Made of bronze, iron with bronze fittings, or all iron. Casing bolts are fitted with special wingnuts for easy removal. Intake and discharge ports are 1 inch, and are threaded for standard pipe or hose connection. Blackmer Pump Co., Grand Rapids, Mich.

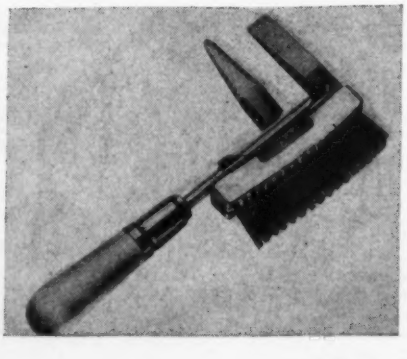


Baking Varnish

Black baking varnish known as Synthite PX-5, possesses the bonding properties required by motor windings. Curing can be controlled by baking temperature and time. Varnish is suitable for all types of bare and covered wire, and is claimed to be oilproof and resistant to abrasives. John C. Dolph Co., Dept. 32, 168 Emmett St., Newark, N. J.

Weld Cleaning Tool

Dual-Tool, weld cleaning tool, combines a wire bristle brush and a slap-removing bit. Brush holder permits quick removal of brush for reversing or replacement. An up-and-outward pry with screwdriver releases tension and brush pops out. Every part of the tool is replaceable. Two models are available. Atlas Welding Accessories Co., 307 Boulevard Bldg., Detroit.



Plastic Paint

Liquid plastic paint for interiors, exterior, concrete floors, etc., expands and contracts with changing temperatures. The manufacturer states that cracks, splits, and joints of reasonable size remain sealed by this plastic bond. Surface is non-porous and impervious to penetration of dirt and moisture; washable by rain, hose, or sponge. Applied by brush or spray. Calumet Plastic Co., Inc., 4704 Calumet Ave., Hammond, Ind.

Dust Collector

Portable Dustkop dust collector has a rated volume of 600 c.f.m. and 4.1-in. static pressure, making it suitable for collecting the dust and dirt from tool, cutter

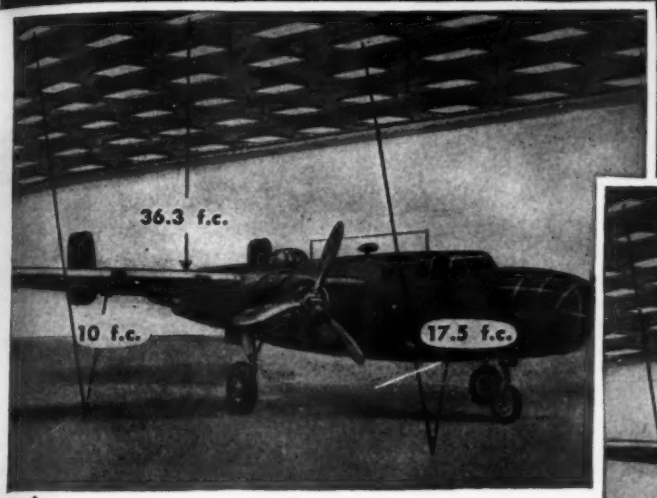
precision, and similar grinding operations. Unit is portable and self-contained. Multiple-blade fan on end of ball-bearing countershaft is driven through a V-belt by a ½-hp. motor of the frequency and voltage required. Aget-Detroit Co., 2040 Book Tower, Detroit.

Tramrail Carrier

Simple arrangement of the ropes forms a triangular suspension that rigidly holds so as to eliminate longitudinal, lateral, and rotational sway. The rope angles have a definite relation to one another. A load can be raised or lowered through a considerable distance and will remain as rigid

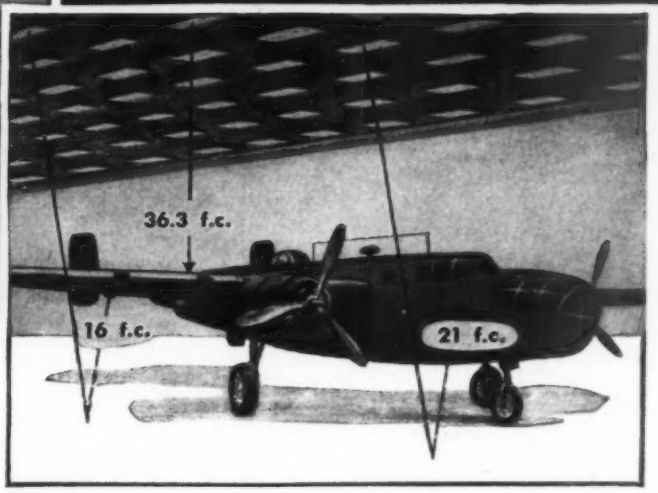
How Light-Reflecting Floors Increase Lighting Efficiency

White-cement floors save light by reflecting it—increase the amount of light on vertical work surfaces and in those hard-to-get-at dark areas.



GRAY-CEMENT FLOOR
Reflection factor 27.4 per cent.

WHITE-CEMENT FLOOR
Reflection factor 44.0 per cent.



LIGHTING INSTALLATIONS in many plants financed by the Defense Plant Corporation are designed to provide about 36 footcandles of light . . . on *horizontal* working surfaces. So far, so good.

But what about other surfaces? What about illumination on vertical faces where so much work must be done? One way to increase the benefit of the investment made in the lighting system is by reflection of light from the floor. And the amount of light a floor will reflect is dependent upon its color. Tests on a 36.3-footcandle installation showed that if the floor is of gray cement, about 17.5 footcandles of light will fall on vertical surfaces. But if the floor is of light-colored concrete made with Atlas White portland cement, about 21.0 footcandles of light will fall upon these surfaces . . . a 20% increase! Compared with a still darker floor, the increase would be even more.

These light-reflecting floors also increase the amount of light on undersurfaces to an even greater extent. Tests on this same installation showed that compared to gray-cement floors, white-cement floors reflect 61% more light onto undersurfaces. Compared with still darker floors, the increase would be much more.

These figures show why you should design your floors to be a part of your lighting system. And when you convert your floors into giant reflectors of light, your men on the job see better . . . work longer without tiring. Result: errors, accidents, spoilage and shutdowns are reduced, and quality and quantity of production goes up.

Mail this coupon today for your copy of "Light from Floors," a new 24-page book containing installation photos, charts, case studies, cost and maintenance data. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York.

. . .

OFFICES: *New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

ATLAS WHITE CEMENT
FOR LIGHT-REFLECTING FLOORS

Universal Atlas Cement Company, Chrysler Building, New York, N. Y.

Please send me copy of new book, "Light from Floors." P-F-13

Name_____

Position_____

Company_____

Address_____

"E" for Excellence

☆ In receiving this joint citation of the Army and Navy, the management and personnel of The Weatherhead Company recognize that the award carries with it not only an honor but a grave responsibility. We will discharge that responsibility by making every effort to increase the flow of vital parts for 'planes, tanks, trucks, ships, combat cars, radios and munitions which Weatherhead plants have been turning out at the rate of millions every day!

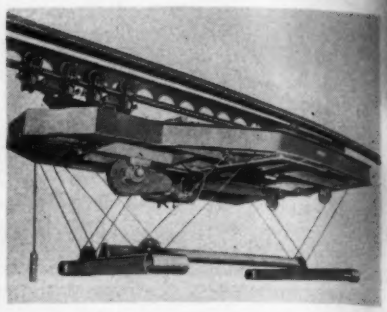
Look Ahead with

Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND, OHIO

Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.

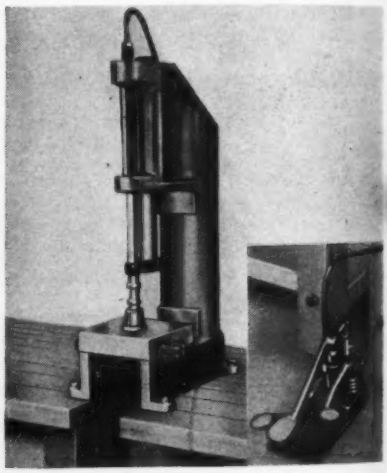
Branch Offices: Detroit, Los Angeles, New York and St. Louis



as if guided in an elevator shaft, it is claimed. Even unbalanced loads are held rigidly in place. Tilting of a load in either direction with relation to the rail or rotating the load may be accomplished. Capacities of 1, 3, and 5 tons, hand-propelled or electrically propelled, all with motor-driven hoist. Carriers may be built to suit individual requirements. Cleveland Tramrail Div., Cleveland Crane & Eng. Co., Wickliffe, Ohio.

Hydraulic Arbor Press

Hydraulic arbor press, called Speedpress, is foot controlled. Operator's hands are free for work. May be operated by women. Pressures from zero to 8 tons are obtained



by a pedal on the hydraulic control after the applicator pedal has placed ram in contact with the work. Foot pressure on release pedal returns ram to top of travel. Largest arbor 6 inches in diameter, capacity over table plate 11⅞ inches, ram stroke 7 inches. Press weighs 208 pounds. Studebaker Machine Co., 9 S. Clinton St., Chicago.

Electronic Spot Welding Control

An electronic half-cycle, synchronous control for the precise operation of resistance-welding machines has been announced. Mounted in a protecting cabinet, the control is furnished in two types, with and without a welding transformer, and is designed for bench mounting or wall mounting. Both types can be used either with tongs or suitable bench welder. The circuit makes higher-speed welding possible, and a simplified initiating circuit improves performance and reduces maintenance, it

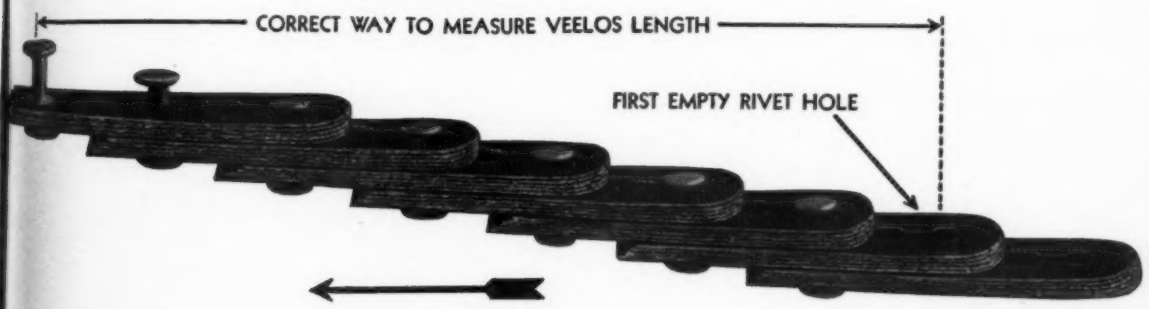
"LINK"

PRODUCTION

TO VEELOS FOR GREATER OUTPUT !

Veelos drives are peak production drives . . . because Veelos is the proved and practical link V-belt. Construction of the Veelos link permits installation and adjustment with a minimum of time and effort . . . assures smooth running. "Link up" your production with Veelos and speed ahead!

HOW TO MEASURE VEELOS



Arrow shows preferred direction of belt travel, although Veelos runs equally well in either direction. On V-flat drives, reverse the direction of travel.

To make a matched set of Veelos V-belts, measure one belt from end rivet to first empty hole as shown in diagram. Make all strands with the same number of segments. *The length of a Veelos belt should be 1" per foot shorter than the pitch length of the drive.* For "D" and "E" sizes, however, shorten only 3/4" per foot.

When desired belt length falls at some point between two rivets, use the rivet which most closely corresponds to the desired length. Veelos' resilience compensates for the fractional difference.

To shorten Veelos belt, simply remove links.

VEELOS

THE LINK

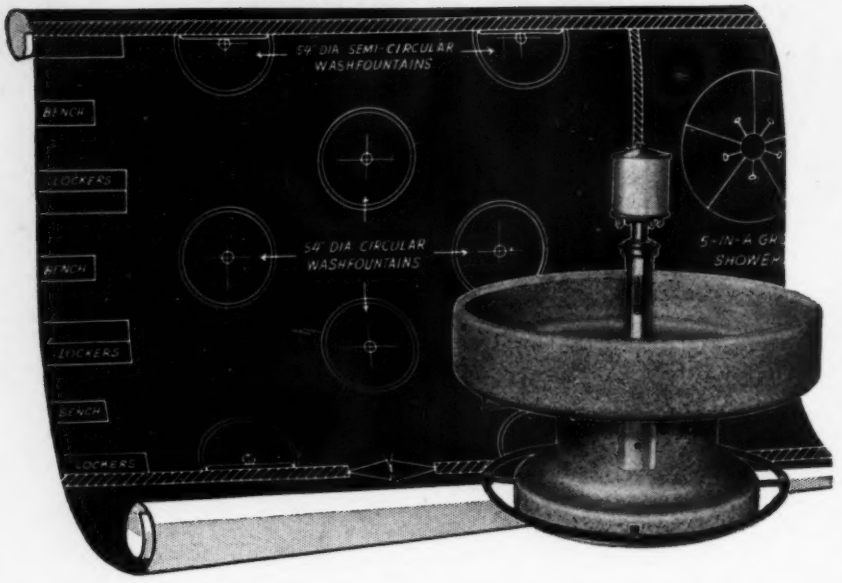
V-BELT

ADJUSTABLE TO ANY LENGTH

ADAPTABLE TO ANY DRIVE

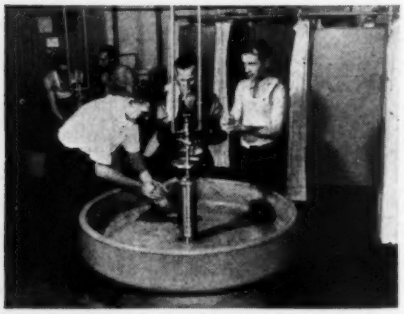
MANHEIM MANUFACTURING & BELTING CO.

MANHEIM, PENNSYLVANIA



Let Us Help You Provide More Washing Facilities—in Less Space

Bradleys serve more people in less space—eight to 10 simultaneously at each group fixture . . . They save 80 per cent of the piping connections (critical metal) because one Washfountain serves as many as eight to 10 "single-person" wash basins . . . 3 connections as against 24 to 30.



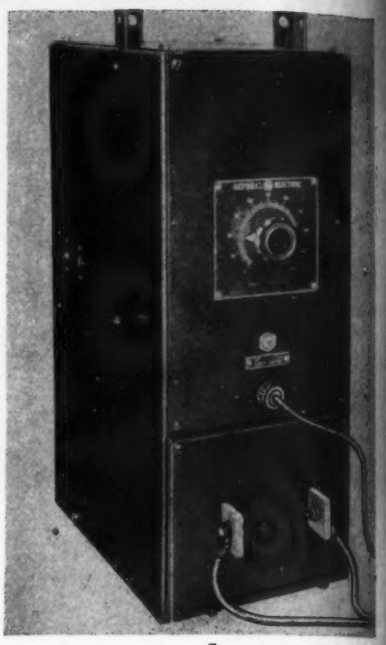
Clean running water for each of 8 to 10 persons simultaneously, a first step in Dermatitis prevention.

They save workers' time and maintenance work. Contaminations and skin affections are reduced since each person washes in clean *running* water like a shower bath.

Provide more facilities NOW for your extra men and women—reduce possibility of Dermatitis which physicians say is a common cause of absenteeism and loss of much needed production.

Our Washroom Consultants are ready to make floor plan suggestions and forward a copy of our "Washroom Layout Booklet." . . . BRADLEY WASHFOUNTAIN CO., 2215 W. Michigan Street, Milwaukee, Wisconsin.

BRADLEY *Washfountains*



is claimed. Heat control is by the phase-shift method; adjustment is made by a dial mounted on the front of the cabinet. General Electric Co., Schenectady, N. Y.

Safety Ramp

Developed to provide non-slip security for men and machines, the steel safety plate ramp can be supported in the center as shown; or may be stiffened with turned-down edges to make a self-supporting port-

able or stationary ramp to bridge pits, holes, and rough spots. The sharp edges of perforated holes, punched through the tops of raised buttons, give the gripping action to these safety plates. Oil, water, and other liquids drop through the holes, making the plates practically self-draining. Morton Manufacturing Co., 5105 W. Lake St., Chicago.

Trailer Truck

Designated to speed up large volume materials handling this Weld-Bilt trailer truck will find use in large industrial plants, railroad warehouses, steamship

More than ever it takes
"oil with guts"
to keep 'em turning

They're veterans of the industrial battle front now. They've been speeded up, 24 hours a day, and they need more care as they grow old so rapidly. Their proper lubrication is all-important these days when the more their productive life is prolonged, the closer we come to final Victory.

Ask the Houghton Man about **fortified** oils, made tough to meet today's tough jobs.

E. F. HOUGHTON & CO.
PHILADELPHIA

CHICAGO **DETROIT**
CLEVELAND **SAN FRANCISCO**

(See other side for Lubrication Hints for War Plants)

In times like these,
A MAN NEEDS ALL THE HELP HE CAN GET!

LUBRICATION HINTS FOR WAR PLANTS

1. Check grease-packed bearings at the recommended intervals, keeping in mind that 24-hour plant operation may cause leakage and destruction of greases in locations where eight-hour days never resulted in trouble.

2. Prevent Rust. Sweaty hands on new parts in the stockroom will cause rusting unless metal parts are well wrapped and coated with an approved rust preventive.

3. Check for Contamination. Check possible leakage of water-soluble cutting oils into hydraulic system of machine tools, or into the lubrication reservoir. To look for contamination, drain off a small sample of the lubricant or hydraulic oil from bottom of reservoir within a week or two after starting, and if no sediment, try it again the next week. When you see sediment or water in the bottle, change the oil and look for cause of leakage.

4. Prevent bearing problems on belt-driven machines. If the job is underbelted and belt tension is unduly increased to make the drive carry the load, this will increase the bearing load and eventually wear out bearings even though well lubricated for normal loads. Proper tension is important.

5. When lubricating open gears, apply the lubricant at several places on the large gear. Dumping it only at the point of contact may result in its being squeezed out, causing insufficient lubrication. The right gear lubricant adequately applied will leave an oily film on the gear even if the heavier lubricant is not visible.

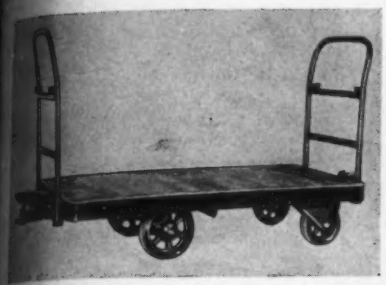
6. Return oil drums promptly and in good condition. There will be no more new metal drums for the duration. You'll get better deliveries and service if you'll take care of the drums you receive, and keep 'em moving.

E. F. HOUGHTON & Co.
PHILADELPHIA
CHICAGO · CLEVELAND · DETROIT · SAN FRANCISCO

★ FIRST AID FOR OVER-WORKED MACHINES: High-film-strength, polymerized Sta-Put Lubricants ★ Dynamo-Turbine-Compressor D. L. Absorbed Oils ★ Fortified-film "High-V.I." Hydraulic Oils ★ Reversible, stable "Absorbed Oils" for Ball and Roller Bearings ★ E. Spindle Oils, Gear Oils, and a host of other lubricants built for 24-hour War Plant du

docks, and other applications requiring long truck trains used in combination with tractors.

Heavily constructed, Weld-Bilt trailer



truck for hand use has heavy angle frame, roller-bearing wheels, and double ball race swivels. A feature of the truck is the trailer hitch which couples automatically by impact. Can be released by pressing latch at top of the hitch with either hand or foot. Truck is available in sizes and types for all needs. West Bend Equipment Corp., West Bend, Wis.

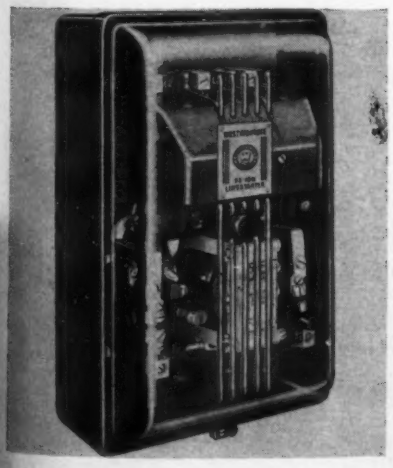
Coolant Strainers

General-purpose coolant strainers in two types, known as Models G and H, prevent chips or particles from being recirculated in the coolant flow. Model G (the grinder model) has three filter elements held side by side by thumb nuts which make them removable for replacement. Installation requires only one pipe connection. Where the size of the coolant tank will not accommodate a triple-unit filter, Model H (single unit) strainer may be installed. Capacities of the Model G strainers range from 15 to 60 gallons per minute; Model H capacities from 5 to 20 gallons. Metal Textile Corp., Orange, N. J.

Starter

For machine tools, textile machinery, pumps, fans, and similar machines. Size 2; Class 11-200 Linestarter, requiring less than half the mounting space of former units for the same wiring space, is announced.

This compact starter designed for group mountings, built-in applications, or remote mountings has a clapper-type armature



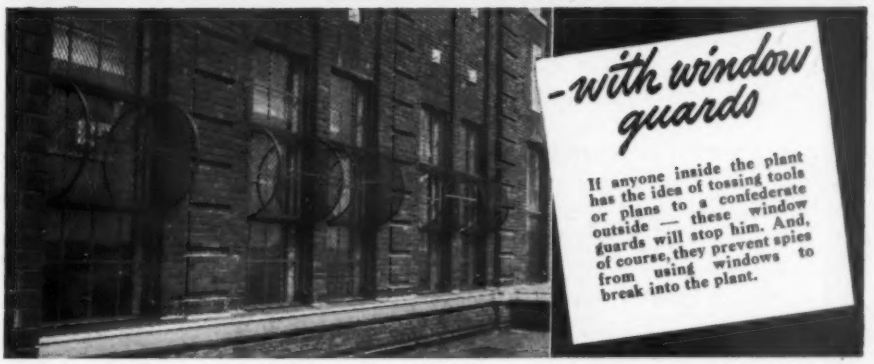
How Industry is fighting the *Spy Menace*

-with sturdy fence

Long before Pearl Harbor, thousands of plants had taken this precaution. Good fence is a strong outer defense against would-be intruders. It would frustrate their plans before they ever gained access to the plant.

-with guarded gates

The only safe way to handle plant traffic is to make everyone show credentials to guards. With guards at all gates you can keep a close check on all persons or materials entering or leaving the plant.



-with window guards

If anyone inside the plant has the idea of tossing tools or plans to a confederate outside — these window guards will stop him. And, of course, they prevent spies from using windows to break into the plant.

HOW complete is your plant protection? Is entrance blocked by strong, high fence? Are vulnerable spots in the plant enclosed? Are windows guarded with a strong, close mesh? If you need the materials for this protection, call on us. Demands are heavy and supplies are limited. But, if you are making war goods and have proper priorities we can provide the fence you need. We'll help you plan your fencing and give you a free estimate.

CYCLONE FENCE DIVISION
(AMERICAN STEEL & WIRE COMPANY)
Waukegan, Ill. · Branches in Principal Cities
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We'll send you our free, 32-page book on fence. It's full of facts, specifications, illustrations. Shows 14 types of fence. Before you choose any fence for your property, get the facts about Cyclone. Mail this coupon today.

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City..... State.....
Interested in fencing: ☐ Industrial; ☐ School; ☐ Playground; ☐ Residence. Approximately.....feet.

MILFORD

FLEXIBLE REZISTOR HACKSAW BLADES

Shatterproof and Unbreakable

ARE NOW

Better than ever!

A better heat-treating method, developed in our own shops, together with an improved steel, have resulted in more uniform and sharper blades . . . so greatly improved that they are equal or superior to 18-4-1 High Speed Steel on any job!

Fast cutting, shatterproof, and unbreakable under excessive pressures and shocks, it is more than ever the blade for insuring trouble-free production on your automatically fed hacksawing machines. *It will pay you to specify* MILFORD FLEXIBLE REZISTOR *by name.*

Hand Sizes Have Easy-Starting Teeth

THE HENRY G. THOMPSON & SON COMPANY

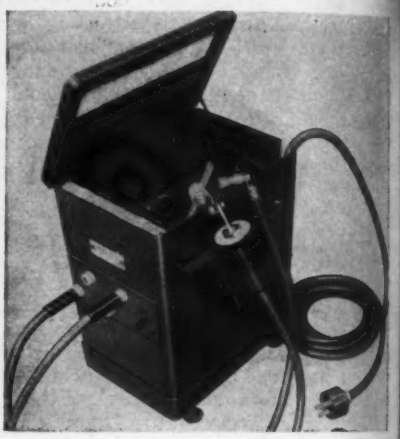
NEW HAVEN, CONNECTICUT

also manufacturers of Milford Profile Saw . . . THE blade for all contour and profile band saw machines.

with knife-edge bearings. Double-break silver to silver contacts eliminate shunts and reduce maintenance, according to the manufacturer. Overload relays are reset either by hand or automatically. Provision is made for a total of four normally open or normally closed electrical interlocks. All parts are accessible from the front and all control circuit terminals and interlock terminals are clearly marked for installation and repair. Westinghouse Elec. & Mfg. Co., East Pittsburgh.

Metallizing Equipment

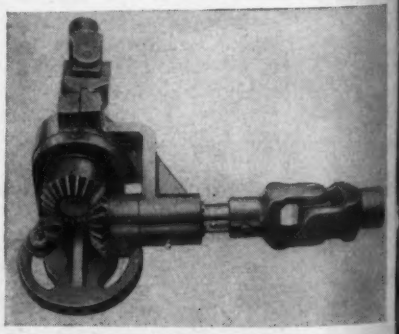
A metallizing accessory, called Fuse-Bond Unit, electrically fuses a rough deposit of electrode metal into the surface to be metallized. Applicable to metal surfaces



where blasting or rough threading is not desirable. As many as six electrodes may be used at a time, and unit prepares small and large parts. The unit weighs 170 pounds, is 24 inches high, is mounted on casters, and operates on 110 or 220 volts single-phase power. Metallizing Engineering Co., Inc., 21-07 41st Ave., Long Island City, N. Y.

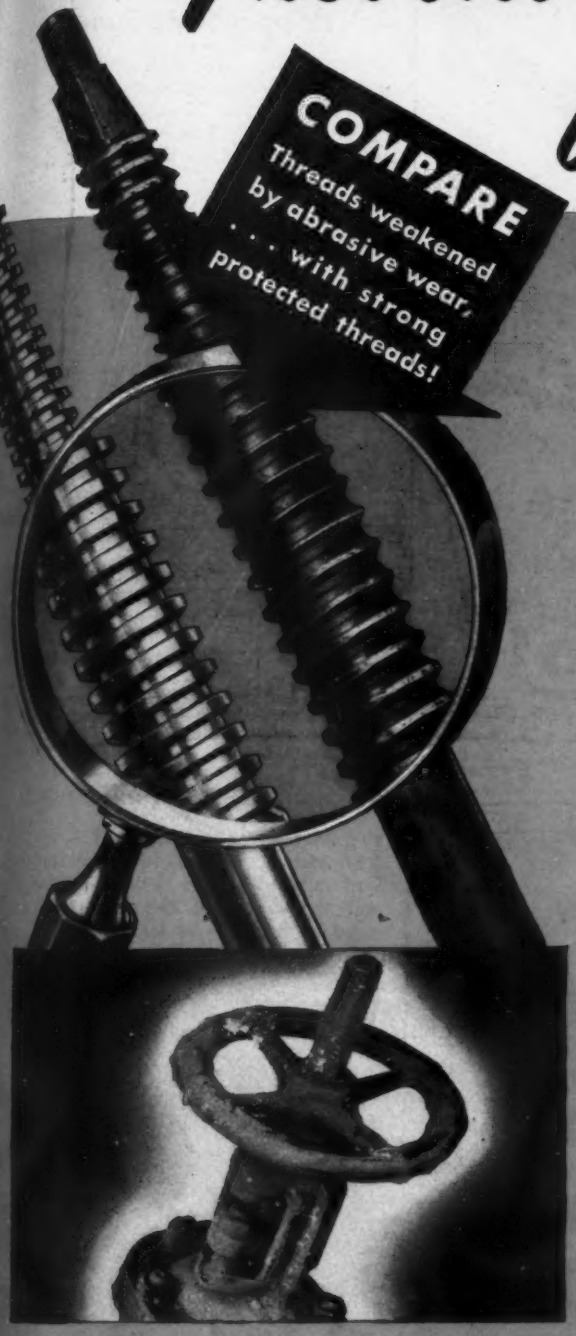
Angle Drive

Almost any angle of operation may be obtained with universal angle drive. While one shaft remains fixed in either horizontal or vertical position, the other may be rotated around the axis of the fixed shaft through an angle of 180 degrees and locked in any position within this range.



When used with two universal joints, an additional angle of 20 degrees is available on either shaft, and a further adjustment is obtained by revolving the base through 90 degrees by aid of circular slots. Easily disassembled. For hand oper-

Prevent Valve Failure *before it starts!*



NEGLECT ruins a valve, and stops a steam line when wear-weakened threads are stripped

This spindle was removed from an Iron Body Globe Valve that failed in service on an important steam line. Compare the threads with those on the new spindle, and note the destructive wear due to the grinding action of dirt deposits.

Corresponding wear weakened the threads in the yoke nuts to a point where they were stripped when the valve was being closed. The valve blew open, and control of the steam line was lost. This failure is another example of careless neglect, of faulty valve conservation measures.

For many plants today, valve repair parts are simply unobtainable. And in war production plants, whose priority allows their purchase, such needless valve failure is inexcusable waste of critical metals. Most serious is the lost production, which may hold up the delivery of urgently needed war materiel.

Inspect valves frequently, systematically. Repair or replace worn parts in time to prevent valves from destroying themselves. See that new valves are carefully selected, installed by experts. And train new men thoroughly in care and maintenance.

Jenkins Engineers will assist any management in preparing an effective program of valve conservation upon receipt of details of present valve problems.

PROPER CARE CHECKS DESTRUCTIVE WEAR

On this Iron Body Globe Valve, two telescoping tin cans shield spindle. The smaller can is fitted up against wheel, and the larger can below against yoke bushing lock nut. An expansion spring inserted inside cans holds them apart as valve is opened.

The spindle of this Bronze Gate Valve is protected by a length of capped metal tubing for the top, wired to hand wheel, and a leather jacket fitted over bonnet of valve just below hand wheel. Grease should be applied inside leather boot to lubricate spindle threads.

The accumulation of dirt on the unprotected spindle (above) is typical of any installation exposed to coal or ash dust, sand, grit, soot, or any other abrasive material. Yet, this valve *can* be kept efficient indefinitely. The threads should be cleaned, deposits blown off, or brushed off, periodically, before they are fed into the nut. Lubrication should be frequent.

Where dust conditions are especially bad, improvised protectors should be used. Two easy-to-make devices are illustrated at the right.

Army-Navy "E" Pennant awarded to Jenkins Bros. for high achievement in the production of war equipment.

Jenkins Bros., 80 White St., New York, N. Y.; Bridgeport; Atlanta; Boston; Philadelphia; Chicago. Jenkins Bros., Limited, Montreal; London.

JENKINS VALVES

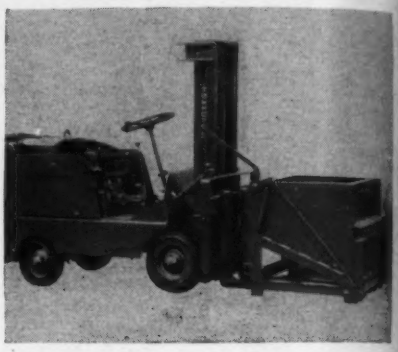
For every industrial, engineering, marine and power plant service . . . in Bronze, Iron, Cast Steel and Corrosion-Resisting Alloys . . . 125 to 600 lbs. pressure.

FLASH!
It's connected
—a slight push of plug into socket, it's connected and air is automatically turned on.
HANSEN
PUSH-TITE
AIR HOSE COUPLINGS
To-day it's production for production's sake—to-morrow it will be production to meet competition, in both cases speed is the keyword. Haste without waste and that's exactly what you get when you use Hansen Push-Tite air hose couplings, first choice in most of the large and small industrial plants throughout the country. Hansen Push-Tite air hose couplings operate easier, faster, conserving time, effort and air. They produce more, last longer, with far less trouble. Send in for free catalog.
FLASH!
It's disconnected
and air is automatically turned off by simply pulling back outside sleeve with thumb or finger.
Hansen MFG. CO.
INDUSTRIAL Air Line EQUIPMENT
1786 EAST 27TH STREET · · · · CLEVELAND, OHIO

ation, it can transmit approximately ½ hp. at speeds not exceeding 300 r.p.m. Payne Dean & Co., Laconia, N. H.

Hopper Attachment

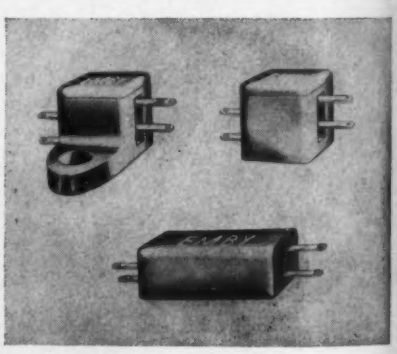
Designed for use with standard fork equipment, hopper attachment is available in various sizes. Attachment is carried directly on the fork support bar of a lift truck by a hook arrangement that is



a part of the hopper. Hopper gate is opened for discharge by pulling down a hand lever which is within reach of the operator. Quick, complete emptying is assured by the slanting hopper bottom. The gate is closed by gravity and is secured by an automatic-catch latch. Towmotor Corp., 1226 E. 152nd St., Cleveland.

Selenium Rectifiers

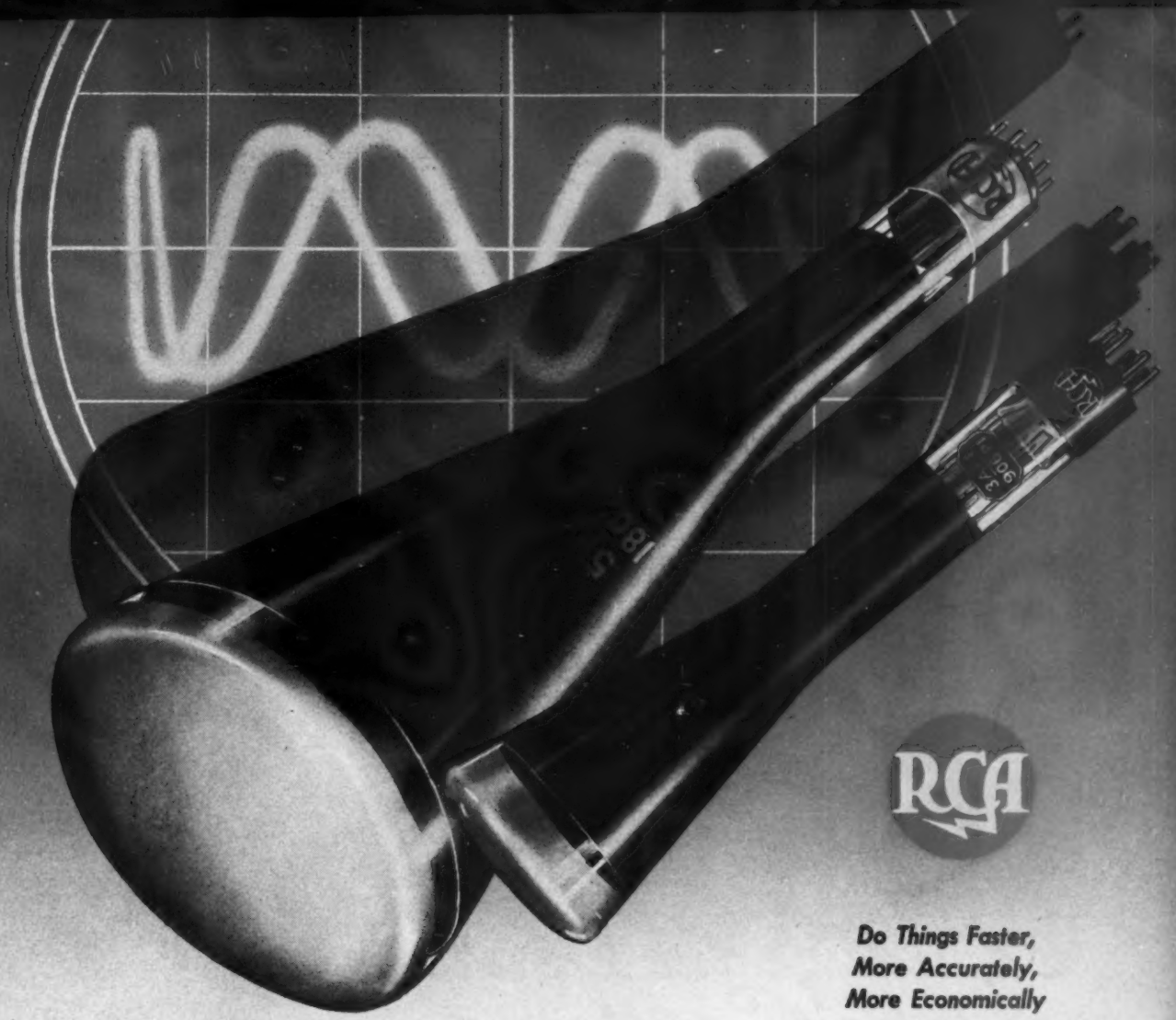
Rectifiers for instruments and relays utilize metal to selenium junctions for rectification. The makers claim unlimited life, and also state that the units will withstand temperatures up to 70 degrees Centi-



grade. Rectifiers are small, supplied in metal or unbreakable molded inclosures, and are available in eight sizes ranging from 8 to 120 milliamperes. Embry Products Co., 1804 W. Pico Blvd., Los Angeles, Calif.

Floodlighting Projector

Made of steel or cast iron treated by porcelain enameling, the RDS floodlighting projector is said to be weather resistant and rustproof. Silvered mirror crystal glass reflector, adjustable beam, special focusing mechanism for correct light placement, quick acting safety type cover clamps, and easy installation are among the outstanding features claimed for this



Modern Measurements . .

without mechanical movement or its limitations

Perhaps no single type better illustrates the indispensable nature of the Electronic Vacuum Tube throughout science and industry than RCA Cathode-Ray Tubes.

Used in Oscillographs, these tubes are pacing the way to new, higher standards of measuring anything or any phenomena that can be transformed into electrical impulses—and doing it without mechanical movement and the limitations inherent in such movement. Every day, RCA Cathode-Ray Tubes are proving unexcelled in the development and production of war materiel. They are being used in such widely diverse fields as acoustics and vibration studies . . . studies of magnetic phenomena . . . water-leak tests . . . geological and geophysical investigations . . . manufacturing operation tests . . . ignition timing and adjustment work . . . medical and biological research . . . engine-pressure indications . . . power plant maintenance . . . aeronautical engine synchronization . . . and a host of others, including their better-known applications in communications, radio and servicing.

Other RCA Tube types, from Phototubes to Power Tubes, are doing equally important jobs contributing to the war effort along entirely different lines—and doing them so well that today's *"Do It the Electronic Way"* becomes far more than a slogan. It stands as a challenge to every civilian and war industry to handle countless tasks faster, more accurately, or more economically than they have ever been handled before!

RADIO CORPORATION OF AMERICA
RCA Victor Division, *Camden, N. J.*

Do Things Faster,
More Accurately,
More Economically

THE ELECTRONIC WAY!

Communicating • Measuring • Checking
Analyzing • Actuating • Protecting
Testing • Detecting • Matching • Sorting
Controlling • Magnifying • Heating
Rectifying • Counting • Transforming
"Seeing" • "Feeling"

The following RCA Tube publications are available from RCA Commercial Engineering Section, 421 So. Fifth St., Harrison, N. J.

RCA PHOTOTUBES (booklet on request)

RCA POWER AND SPECIAL PURPOSE TUBES (catalog on request)

RCA TRANSMITTING TUBE GUIDE (Guide 35c net)

RCA TUBES FOR INDUSTRIAL EFFICIENCY

High-vacuum, gas, and vapor tubes . . . voltage amplifiers . . . low-power and medium-power tubes . . . cathode-ray tubes . . . phototubes . . . rectifiers . . . voltage regulators . . . relay tubes

HAVE YOU A *Problem in*

Capitalize the Service of the Carey REPRESENTATIVE

Today, more than ever—the big job of the Carey representative is *serving* industry. His time for the duration is dedicated to helping you attain utmost economy in plant maintenance—top efficiency in plant operation.

Every Carey man is thoroughly trained from the ground up in the use and application of Carey Products. Representing one of the oldest and largest manufacturers of roofing, waterproofing and insulation materials in the country, he is qualified by experience to make practical recommendations.

Capitalize this Carey service when our representative calls on you. Whatever your needs, you'll find that he will do everything humanly possible to be of real help in analyzing your problems and in finding the economical answers. For details address Dept. 31.

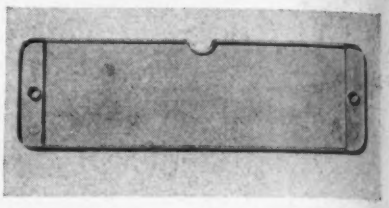
Carey PRODUCTS INCLUDE:
BUILT-UP ROOFINGS • ROOF COATINGS
HEAT INSULATIONS • CAREYDUCT
INDUSTRIAL ASPHALT FLOORING
ASPHALT ROOFING & SHINGLES
ROCK WOOL INSULATION
EL-ASTITE EXPANSION JOINTS
ASBESTOS-CEMENT CORRUGATED ROOFING & SIDING

THE PHILIP CAREY MFG. COMPANY
Dependable Products Since 1873
Lockland, Cincinnati, Ohio
In Canada: **The Philip Carey Co., Ltd.**
Office and Factory: **Lennoxville, P. Q.**

projector. Units are furnished in two models: RDS 14 for 300- and 500-watt general service lamps or 500-watt floodlighting lamps, and RDS 18 for 750- and 1000-watt general service lamps or 1000-watt floodlighting lamps. Plain, stippled, or ribbed heat-resisting glass covers. Benjamin Electric Mfg. Co., Des Plaines, Ill.

Plastic Card Holder

Plastic identification card holder is made of transparent cellulose acetate. It can be affixed to either wood or steel shelving, lockers, doors, etc. Provides a transparent



and protective covering for the card and is said to be unusually durable. Over-all size of the holder is $3\frac{3}{8}$x$1\frac{1}{8}$x$\frac{1}{8}$ inch. Card space is $3\frac{1}{4}$x1 inch. Penn Metal Corp. of Penna., Oregon Ave. and Swanson St., Philadelphia.

Consolidation

Acquisition of the Pomona Pump Company, Pomona, Calif., its Westco Pump Division, St. Louis, and the Crocker-Wheeler Electric Manufacturing Company, Ampere, N. J., has been announced by Joshua Hendy Iron Works, Sunnyvale, Calif.

Respirator

All-plastic respirator, known as the Clear-Vue Model Dustfoe, is approved by the U. S. Bureau of Mines. Compact and lightweight, respirator is made of transparent plastic claimed to be durable, odorless, non-corrosive, and a non-conductor of electricity and heat.

Catch on the filter case locks positively only when the filters are in the correct position. Unit gives protection against pneumoconiosis-producing, nuisance, or toxic dusts. It can be disassembled without tools in a few seconds. All parts of the Clear-Vue are interchangeable, and

COURAGE

We shall need all our courage and all our strength and a great deal of our money to overcome the mighty adversaries who are opposing us.

Against powerful and resolute foes we can emerge victorious only by being more powerful and more resolute.

But whatever the price, whatever the sacrifice, the cost will be trifling in comparison with the price we would have to pay for disaster.

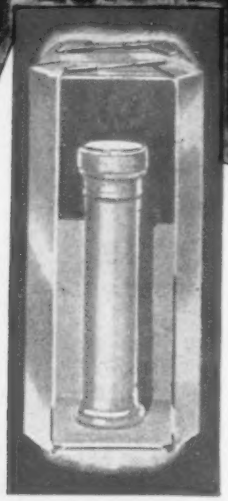
In line with the entire rubber industry, this Company is cooperating with the Government in every possible way to insure victory as promptly as it can be achieved, and in this emergency it may be impossible for you to secure many of our products for purely civilian needs.

The stake is Liberty — America! Be the cost what it may, the stake is worth it.

BOSTON WOVEN HOSE & RUBBER COMPANY

WORKS: CAMBRIDGE, MASS., U. S. A.

P. O. BOX 1071, BOSTON, MASS., U. S. A.



• • • ▬ We can't tell you much—we can't picture accurately the design and synchronization of Lamson Ammunition Conveyors and Hoists being built for U. S. War Vessels—but we can tell you that they're fast and are helping to raise the firing rate to gun-capacity!

Lamson Conveyors and Lamson Dispatch Tubes are not only serving our Army and our Navy—they're also expediting the production of arms, aircraft, and munitions in the Nation's biggest War plants . . . where secure, efficient movement of material and necessary paper work is so vital.

LAMSON CORPORATION

Dept. FM-2, — Syracuse, N. Y.

Makers of CONVEYORS and PNEUMATIC DISPATCH TUBES

can be washed and sterilized. Mine Safety Appliances Co., Braddock, Thomas, and Meade Sts., Pittsburgh.

Carbon Dioxide Fire Extinguisher

Carbon dioxide fire extinguisher, known as C-D/Fog, is Underwriters' approved. May be used on oil or flammable liquid fires and on live electrical equipment.

Vaporizing liquid applied by horn gives rapid action in putting out fire, it is claimed. Non-freezing, extinguisher does not leave an after-fire mess. General Detroit Corp., 2200-2272 E. Jefferson Ave., Detroit.

Electric Sander

"Sterling" 1000 electric oscillating sanding machines are built for heavy service. Features include streamlined vibrationless unit, compact size, and snap-action switch. Powered by a ½-hp. universal motor protected from dust by replaceable filter

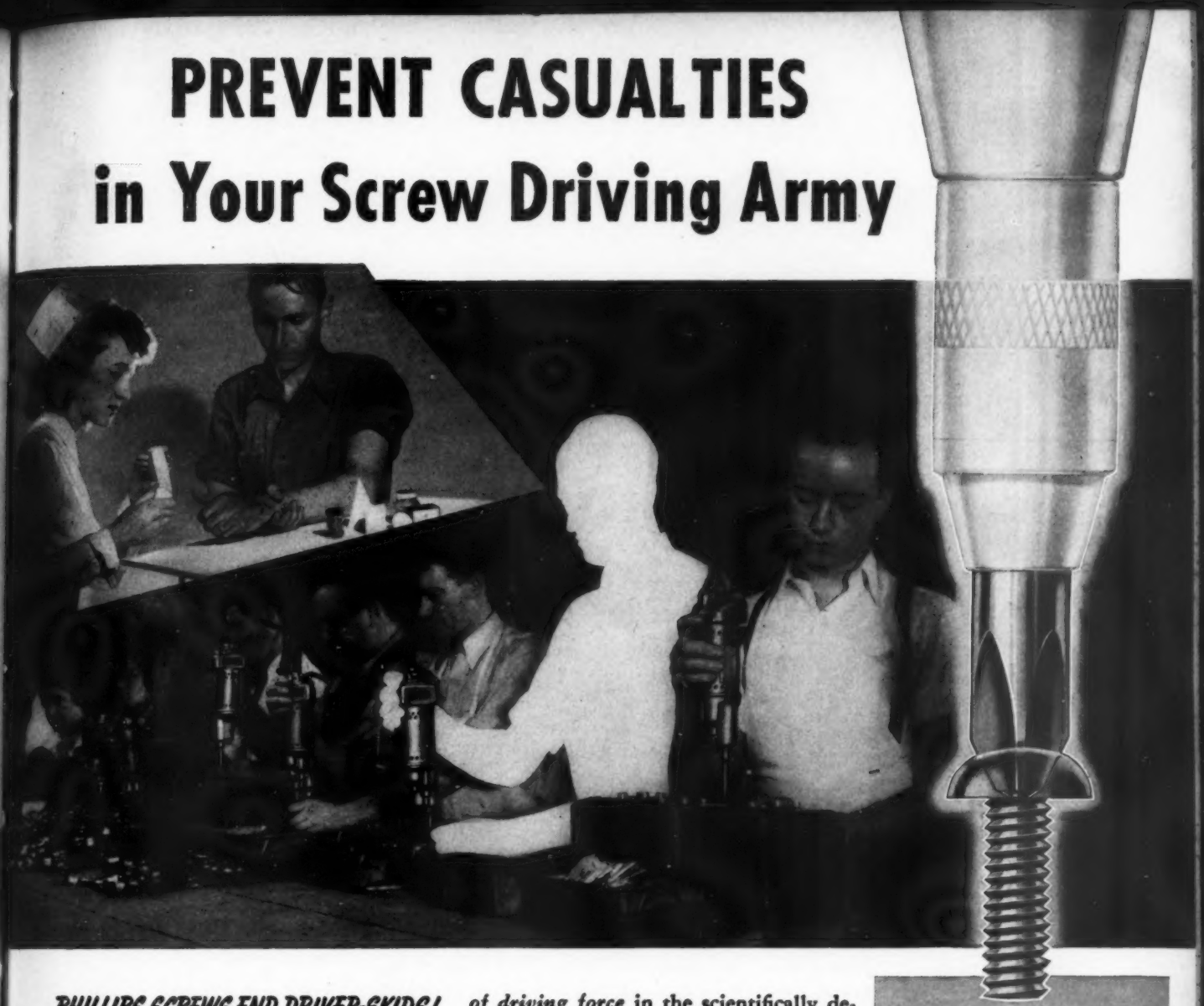
screen. Gears and counterpoise mechanism sealed in dustproof cartridge-type gear case. Detachable sanding pad is held by simple latch-type lock, takes ¼ sheet of standard abrasives, and is flexible to permit sanding on curved or flat surfaces. Tumbler action clamps lock abrasive sheets on sanding pad. Sterling Tool Products Co., 363 E. Ohio St., Chicago.

All-Plastic Badge

An all-plastic identification badge for war workers, which it is claimed will save approximately one ton of needed metal on every 40 thousand badges made, has just been placed on the market.

Plasticseal badge is attractive, lightweight, durable, non-burning, non-sparking,

PREVENT CASUALTIES in Your Screw Driving Army



PHILLIPS SCREWS END DRIVER-SKIDS!

"Speed up, and do it safely!" That's 1943's war production challenge. This year we can't afford another sacrifice of 500 million worker days to preventable shop accidents . . . like injuries from skidding screw drivers.

Safety measure No. 1 for screw driving operations is accomplished when you specify screws with the Phillips Recessed Head. The driver *can't* slip out of the recess to slash a worker, or damage the work!

Relieved of fear, workers naturally step up speed. And, the *automatic centering of driving force* in the scientifically designed Phillips Recess eliminates many other handicaps to speed: the fumbling, wobbly starts . . . re-driving of slant-driven screws . . . removal of broken-head screws . . . reclaiming of marred parts. Fast, faultless, *safe* driving becomes automatic, even for "green hands." Power driving becomes practical.

They cost less to use! Compare the cost of driving Phillips and slotted head screws. You'll find that the price of screws is a minor item in your total fastening expense . . . that it actually costs less to have the many advantages of the Phillips Recess!

KEY TO FASTENING SPEED AND ECONOMY

The Phillips Recessed Head was scientifically engineered to afford:

Fast Starting – Driver point automatically centers in the recess . . . fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.

Faster Driving – Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)

Easier Driving – Turning power is fully utilized by automatic centering of driver in screw head. Workers maintain speed without tiring.

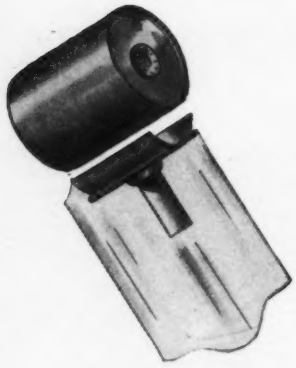
Better Fastenings – Screws are set-up uniformly tight, without burring or breaking heads. A stronger, neater job results.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

21 SOURCES

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Reading Screw Co., Norristown, Pa.
Pheoll Manufacturing Co., Chicago, Ill.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.



"ASH-CANS" TO TOSS AT STEEL SHARKS

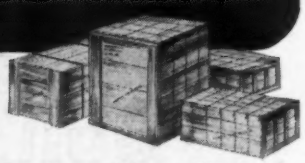
SAFE arrival at destination of all types of products, depth bombs, planes, munitions, food, etc., products which the boys are depending on—demand containers that provide adequate protection against rough handling and extreme weather conditions.

General Boxes comply with specifications set up by Government authorities for overseas and overland shipments. They are designed to meet specific shipping problems. Steel binding wires give these containers the extra strength required for the extremely tough conditions of overseas travel.

General Boxes conserve manhours . . . occupy minimum space in ships, trucks, trains and on the shipping room floor. Tare weight is cut to a minimum while handling is greatly facilitated. If you have overseas shipping problems, write us. General Box engineers have had extensive experience in helping war products shippers meet Government packing specifications.

For manufacturers of war products: General Heavy Duty Wire-Bound and Nailed Wooden BOXES and CRATES
For Domestic Service: Corrugated BOXES and Wood Cleated Fibreboard CRATES
Discontinued for the Duration: Generalite and Nailed Strapped BEVERAGE CASES

GENERAL BOX COMPANY

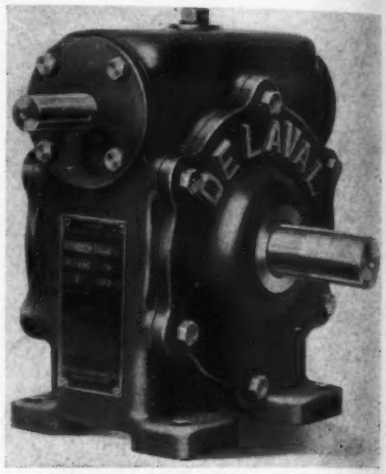


GENERAL OFFICES: 504 North Dearborn Street, Chicago, Illinois
DISTRICT OFFICES AND PLANTS: Brooklyn, Cincinnati, Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, New Orleans, Sheboygan, Winchendon; Continental Box Company, Inc.: Houston, Dallas.

non-magnetic, and completely tamperproof, according to the manufacturer. Clasp can be had in two forms—a spring-pin type set into the case or a safety catch riveted onto the back of the case. Royal Emblem Co., 38 John St., New York.

Worm Gear Reducers

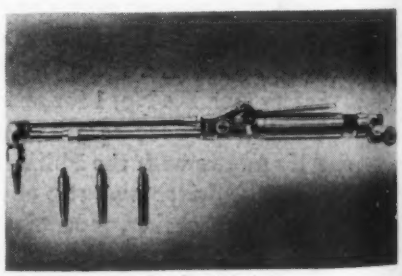
Small worm gear reducers have ratios of $3\frac{3}{8}$ to 1 up to 60 to 1 and in 3- and $3\frac{1}{2}$-in. center distances. Casings are cast in one piece with side plates totally inclosing



working parts and serving as an oil reservoir. Interior is accessible upon removing one of the side plates. The worm shaft is carried on ball bearings and the wheel shaft on Timken bearings. Units are supplied for either top or bottom drive, with shaft extension to either right or left or in both directions. De Laval Steam Turbine Co., Trenton, N. J.

Cutting Torch

Rugged, fast torch will handle regular plate cutting, hole piercing, cutting multiple plate, billet deseaming, cast iron, and rivet washing. Mixing principle provides



fast preheating. Stainless steel oxygen and acetylene needle valves are non-seizing, non-scoring to provide sensitive and positive preheat flame adjustment. National Cylinder Gas Co., 207 Wacker Drive, Chicago.

Coal-Pile Fire Extinguisher

A 12-ft. length of 2-in. pipe provided with a point and a number of $\frac{1}{8}$-in. holes at one end and screw cap at the other, is the extinguisher. These pipes are filled with

WESTINGHOUSE NEW DRY-TYPE TRANSFORMERS

36% copper saving . . . 50% steel saving . . . *and a better transformer!* That is the new Westinghouse Dry-type Distribution Transformer. (Ratings from 1 to 100 Kv-a.)

Three things make this transformer possible:

1. **HIPERSIL*:** the new Westinghouse electrical steel that has one-third more flux-carrying capacity . . . saves copper and steel.
2. **CLASS B INSULATION:** permits more Kv-a output with less copper in the windings.
3. Westinghouse Engineering "KNOW-HOW" in pioneering and combining new developments into practical critical material-saving transformers.

The smallest and lightest indoor distribution transformer ever built, this new Westinghouse design adds to the inherent advantages of Dry-Type Transformers:

- **SPACE SAVING . . .** Mount a dry-type anywhere indoors . . . on a shelf, a post, or overhead.
- **TIMESAVING . . .** No fireproof vaults required.
- **IMPROVED VOLTAGE REGULATION and COPPER SAVING . . .** Located at the machine, the dry-type eliminates long heavy secondary runs.
- **NO LIQUIDS** to inspect, change or filter.

J-70399

Ask your Westinghouse Representative for full details on this lighter and smaller transformer. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

*Registered trade-mark, Westinghouse Electric & Manufacturing Company, for HIgh PERmeability SILicon steel which carries ½ more flux.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

DISTRIBUTION TRANSFORMERS

Federal Sealed Arc
SAFETY FACTORS

PREVENT PRODUCTION SLOWDOWNS

Switch failures slow up production. That's why Federal "Sealed Arc" Safety Switches* are built with extra safety factors to insure continuous, dependable, trouble-free operation on essential circuits. Federal's "Sealed Arc" construction, for instance, is a confining porcelain "straightjacket" with ribbed arcing chutes that break up and snuff the arc before it can do damage.

Other safety factors that are making Federal switches "musts" with more and more manufacturers are:—dead front shields over live parts, high grade insulating material throughout, ample spacing between live and grounded parts, unobstructed wiring, rugged construction to insure permanent alignment of working parts, and patented "grip-tite" fuse clamps for better connections. Follow the leaders—for extra service and safety switch to Federal!

** "Sealed Arc" construction up to 200 Amperes. 400 to 1200 Amperes Knife Blade Type.*

For Complete Safety Switch Data

write for Catalog 42. Contains all the essential facts on Types A, C and D Federal "Sealed Arc" Safety Switches.

FEDERAL ELECTRIC PRODUCTS COMPANY

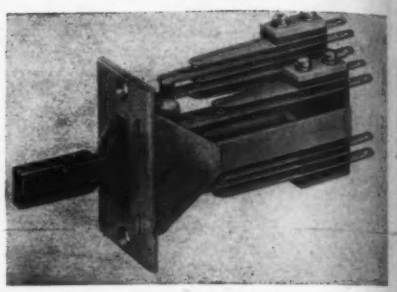
58 PARIS STREET, NEWARK, N. J.

PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

crushed solid carbon dioxide or dry ice and driven into the coal pile around the fire zone. The cooling effect of the dry ice plus the carbon dioxide gas will return the danger spot to normal, it is claimed. Coal Specialties Co., 50 Church St., New York.

Lever Switch

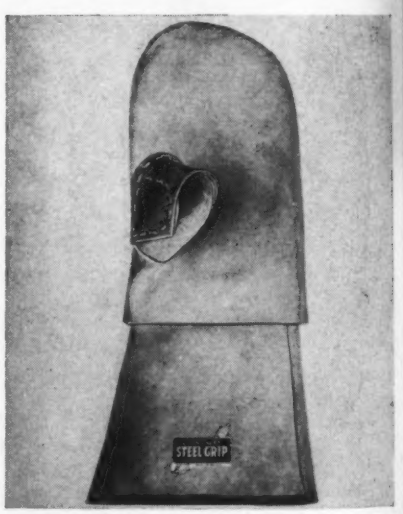
The Mossman Lever Switch O-42 can be used for communication, annunciator, and fire alarm systems. It is available in an almost unlimited series of combinations



of contact assemblies. This switch has positive action—locking, non-locking, and no-throw stops. Handle permits a firm grip by a gloved hand. Rating—maximum recommended—5 amperes, 110 volt, a.c. Donald P. Mossman, Inc., 6133 E. Northwest Highway, Chicago.

Mitten-Guard for Welders

A mitten-guard, or booster, saves wear and tear on welder's gauntlet gloves. Made of heat-resistant leather, this guard, a mitten

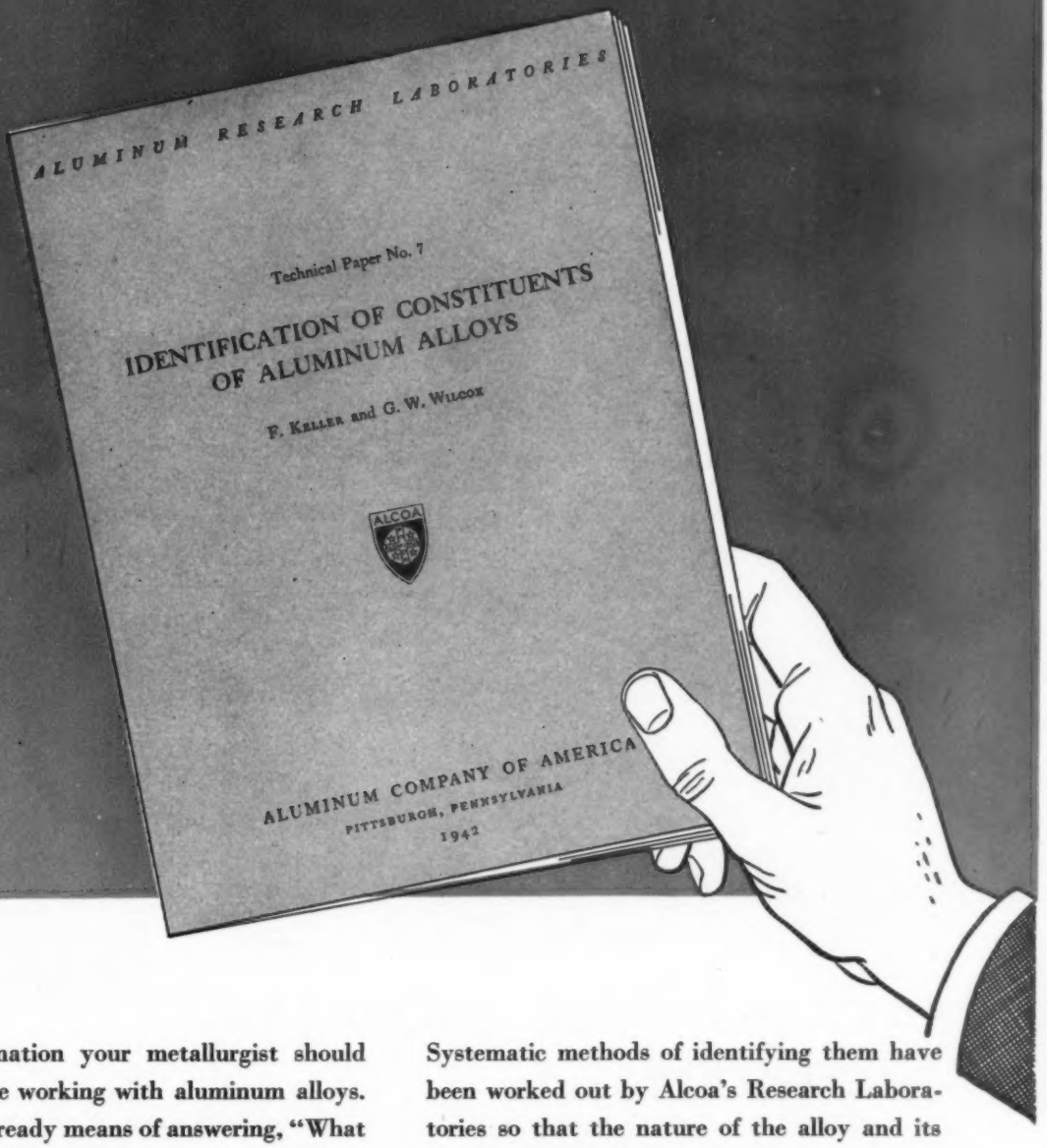


with open-end thumb, is slipped over the left-hand glove and provides the needed protection against sparks and molten metal. Guard is readily slipped off after the welding is completed. Industrial Gloves Co., Danville, Ill.

Floor Covering

A non-skid type of covering that can be readily applied to steel or wood with a brush or trowel has been developed. Durable and waterproof, this material, marketed under the name of Armstrong's Lightweight Deck Covering, forms a

To help your metallurgist tell "*Whats in it?*"



Here's information your metallurgist should have, if you're working with aluminum alloys. It provides a ready means of answering, "What type of aluminum alloy is it?"

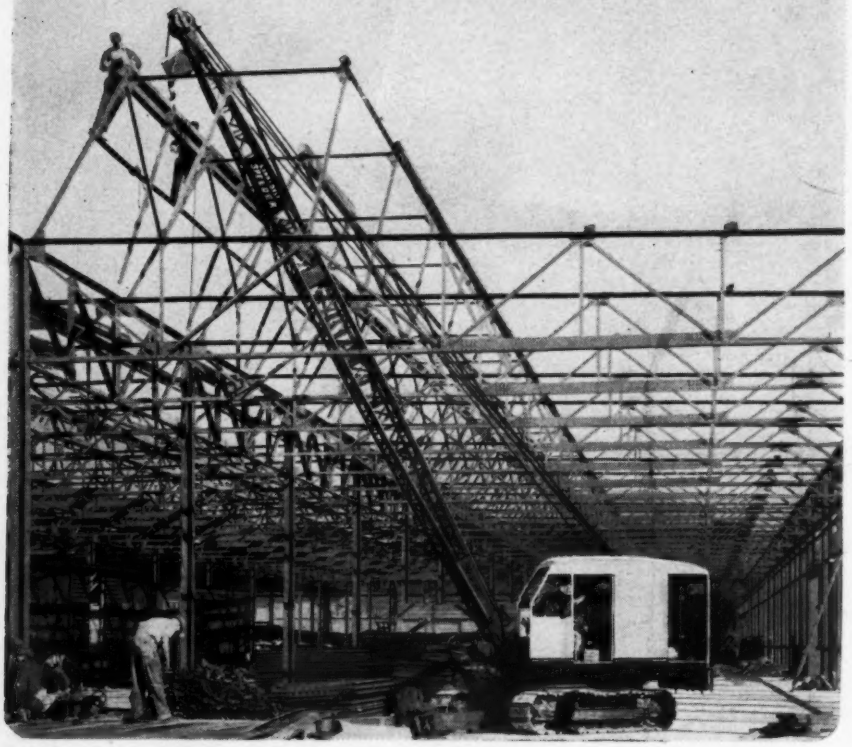
Technical Paper No. 7 presents metallographic methods for examining aluminum alloys. How to prepare a specimen is told in detail; cutting the sample, mounting, polishing and etching.

Metals alloyed with aluminum form a variety of constituents of microscopic size. Systematic methods of identifying them have been worked out by Alcoa's Research Laboratories so that the nature of the alloy and its metallurgical treatment are revealed by the microscope. Chemical etching treatments color the constituents and reveal their form so that they can be identified by the systematic pictorial guide provided in this technical paper.

Your metallurgist may want a copy of Technical Paper No. 7. Write ALUMINUM COMPANY OF AMERICA, 2126 Gulf Bldg., Pittsburgh, Pa.

ALCOA ALUMINUM

LET LINK-BELT SPEEDER HORSEPOWER... CONSERVE YOUR MAN POWER!



SPEEDY, EFFICIENT HANDLING OF MATERIALS...

If you're loading and unloading or moving big and bulky materials that are usually hard to handle, you'll appreciate this fast and powerful, easy to operate, Link-Belt Speeder. It gets such jobs done on time—and you can release many men in these trying days for other important duties.

9038

LINK-BELT SPEEDER

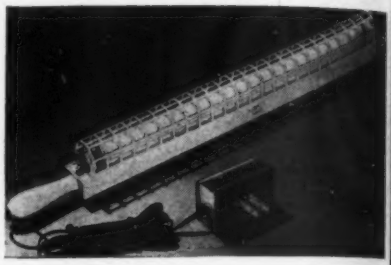
BUILDERS OF THE MOST COMPLETE LINE OF SHOVELS—CRANES—DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO, ILL.
(A DIVISION OF LINK-BELT COMPANY)

ready bond and needs no elaborate preparation before application. Material is manufactured of high-grade rosins and contains no asphalt. Covering is available in four colors, black, red, blue, and gray, and is suitable where a highly nonskid surface is essential. Armstrong Cork Co., Lancaster, Pa.

Portable Fluorescent Lamp

Portable fluorescent lamp provides diffused lighting with low surface brightness and insures better visibility on shiny metal



surfaces. Available in two sizes, for 6- and 15-watt fluorescent lamps. Lamp is protected by rigid steel grid guard. Ballard plug is used. The Edwin F. Guth Co., 2615 Washington Ave., St. Louis.

Fire Detector

Actuated by the flames themselves rather than the heat of a fire, flame detector closes circuit to operate alarm or extinguishing circuit. The basic element con-

sists of two organic filaments holding an electrical circuit open. Slightest contact with flame destroys these filaments, it is claimed, and the circuit is closed. There is also a fixed-temperature thermostat in the flame detector, that is set high enough to override operating temperature conditions. Walter Kidde & Co., Inc., West St., Bloomfield, N. J.

Reset Timers

Synchronous motor-driven timers, RS4 and RS5, are of the reset type and are available for ranges up to 5 hours and longer. Timers repeat cycle upon manual operation of a built-in start button, and show by a progress indicator the expired and unexpired time cycle and the setting time. The RS4 timer opens or closes the circuit, depending upon the choice of circuit; RS5 is held in a neutral position when the button is depressed, and starts the timing cycle by pulling the start but-

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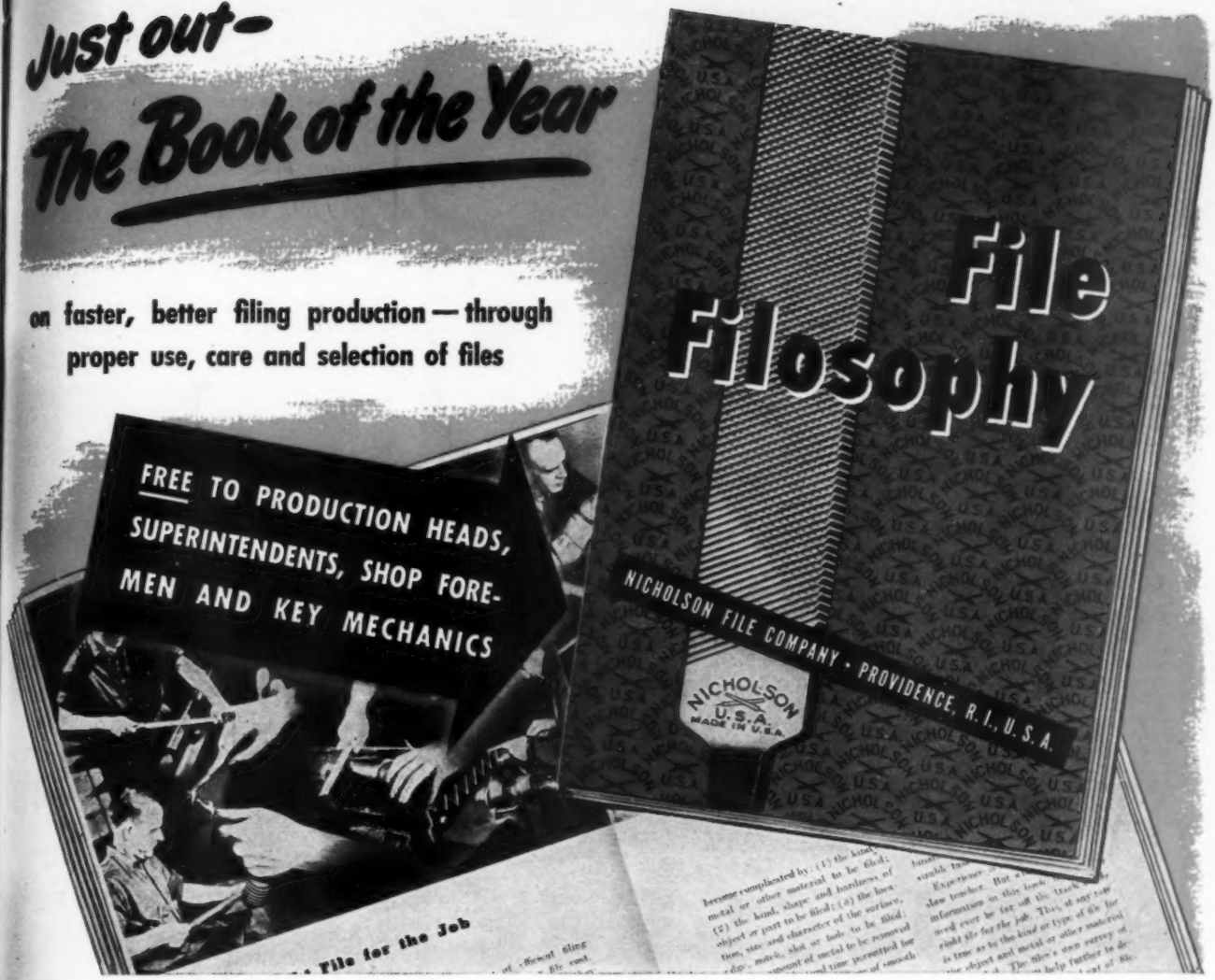
The Book of the Year

on faster, better filing production — through proper use, care and selection of files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FREE TO PRODUCTION HEADS, SUPERINTENDENTS, SHOP FOREMEN AND KEY MECHANICS

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"FILE FILOSOPHY" has been prepared with infinite care. It reflects the experience of 79 years of industrial filing research, file designing and quality file manufacture. It contains the best portions of fifteen editions of a previous file treatise printed under the same title. To it has been added much of the contents of a supplemental Nicholson book, "A File for Every Purpose." Still more has been added to cover today's advances in shop practices and specialization, and new developments in materials and products.

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"FILE FILOSOPHY" is a simple discourse—as understandable to the bench-working mechanic as to the production head. It is an excellent "textbook" for the shop-school instructor. It is particularly helpful to men who have the responsibility of providing *The right file for the job*—for today the Special Purpose file has an important place on the production front. (There are many such files in the Nicholson and Black Diamond lines.)

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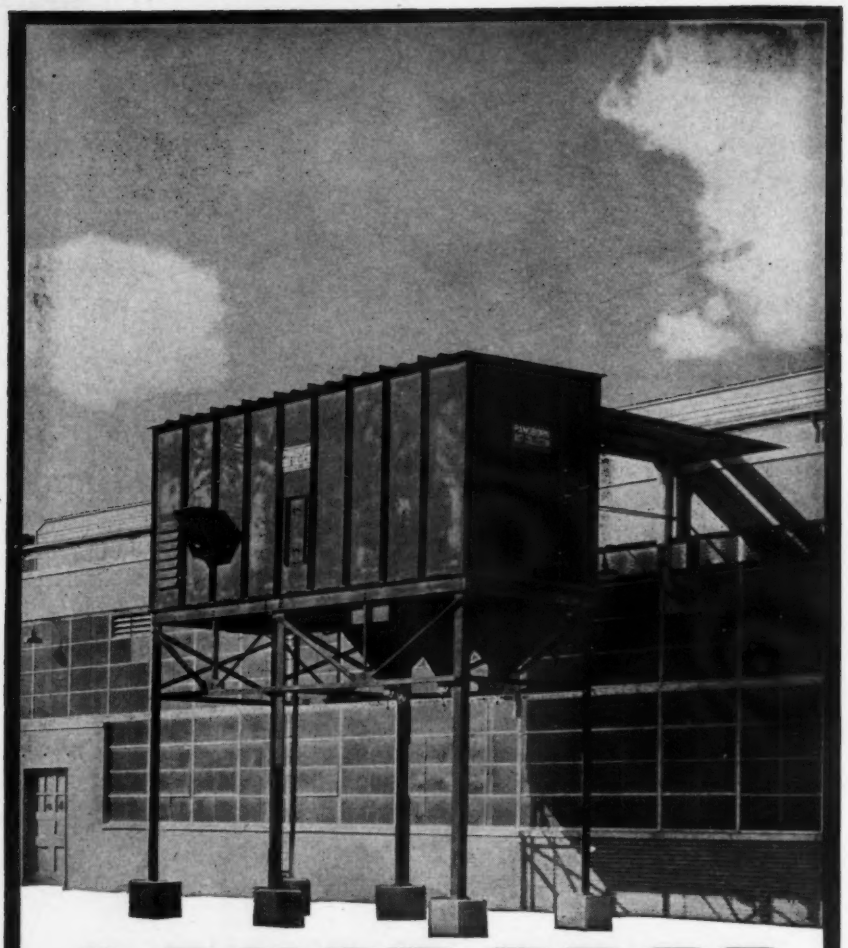

A DUST FREE PLANT

WILL PRODUCE MORE WORK FOR VICTORY!

NOW—more than ever, it is essential to keep men and machines at capacity production by maintaining working conditions at their peak to eliminate lost time.

Pangborn Dust Control systems are doing this job—effectively and economically—in both war and civilian industries. Men, machines and materials are safe from Dust menace when protected with Pangborn installations. A dust-free plant will produce more work for VICTORY. Write.

PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

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ton. Timers operate a single-pole, double-throw switch with a capacity of 10 amperes at 115 volts or 5 amperes at 220 volts a.c. noninductive load. Black bakelite case for flush panel mounting is 3¼ inches in diameter and 4½ inches long. Can be supplied in dust- or moistureproof surface mounting steel housings, or in explosionproof cases. The R. W. Cramer Co., Inc., Centerbrook, Conn.

Portable Car Spotter

One man can handle this spotter, balanced on a channel-iron frame to roll easily from place to place. Operator needs but to

anchor the frame with a chain, plug the electric cord into the nearest power outlet, hook the cable to the capstan and object to be hauled, start the motor, and feed away the cable. Link-Belt Co., 307 N. Michigan Ave., Chicago.

Hand Lift Trailer Truck

Adding self-couplers to the conventional hand lift truck makes the Load King a trailer truck. Front and coupler loop slides through jaw ends of rear coupler, and is

automatically locked by the latch. Coupling is released by stepping on pedal pad. Individual trailers are then used as hand lift trucks to shift load. The Yale & Towne Mfg. Co., 4531 Tacony St., Philadelphia.

Protective Soap and Cream

Liquid Ordnance Soap No. 8 has been developed to scrub off tetryl or TNT and guard the worker against dermatitis. Protective Cream No. 99 is an external protection against these irritants. The base contains a film claimed not soluble in tetryl. West Disinfecting Co., 42-16 West St., Long Island City, N. Y.

INDUSTRY'S NEW RIGHT HAND

The advantages of fluid power transmission as applied in HydrOILic equipment for aviation needs, are just as applicable to all industries. Flexibility of application . . . widely variable adjustment . . . precise and positive control . . . all of these sought-for features are being applied by Denison engineers to the already proved advantages of oil-hydraulic power. HydrOILics has truly given industry a *new right hand!*

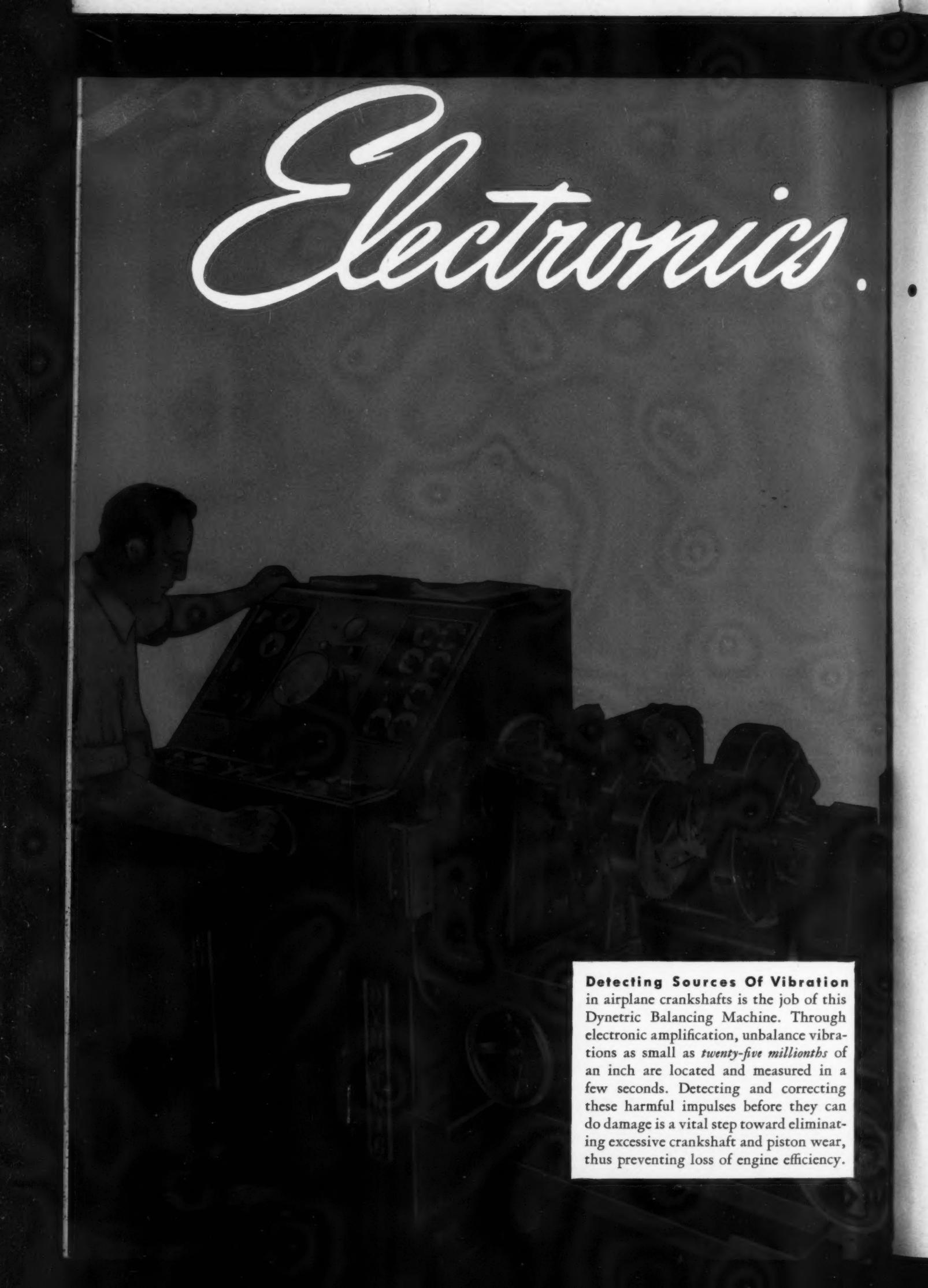
HydrOILics is hard at work on tasks of pushing, pulling, pressing, tilting, clamping, positioning, and similar operations. It is *pulling* massive units of equipment back and forth into position with quiet ease and complete control . . . *pressing* the toughest metal parts to straighten irregularities of as little as a few thousandths of an inch . . . powerfully *clamping* structural or machine parts to speed up and simplify assembling operations . . . *positioning* large parts or equipment for greater accessibility during production. Ask us how HydrOILics can be applied to *your* specific needs. Call your Denison representative, or write directly to the factory.

This 20-ton Denison horizontal press is doing in 2½ minutes a job that formerly required ten . . . the assembly and disassembly of airplane engine crankshafts. The crankshaft is locked in the fixture in three sections, and HydrOILics does the rest with speed and power, under complete control of the operator. War-rushed plants all over the country are getting help like this from Denison equipment in applied HydrOILics.

DENISON
EQUIPMENT *in* APPLIED
HydrOILics
TRADE-MARK

THE DENISON ENGINEERING COMPANY
1154 DUBLIN ROAD COLUMBUS, OHIO

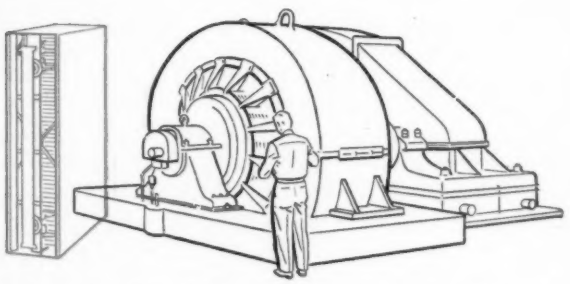
Electronics...



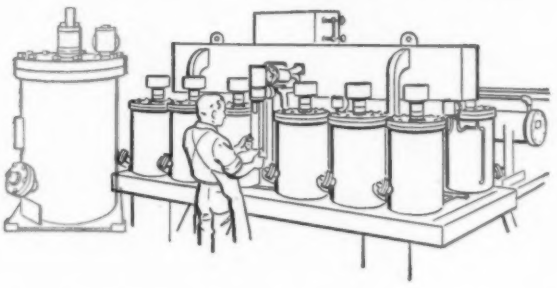
Detecting Sources Of Vibration in airplane crankshafts is the job of this Dynetric Balancing Machine. Through electronic amplification, unbalance vibrations as small as *twenty-five millionths* of an inch are located and measured in a few seconds. Detecting and correcting these harmful impulses before they can do damage is a vital step toward eliminating excessive crankshaft and piston wear, thus preventing loss of engine efficiency.

. . . at Work

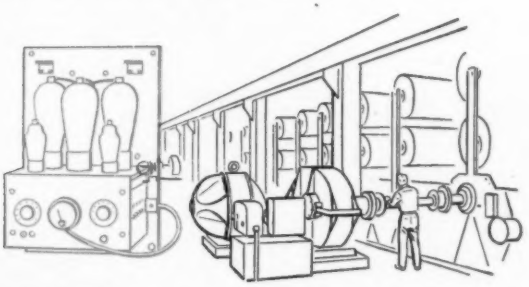
Electronic devices are at work today in practically every war industry. They are helping to roll back old limits on production capacity—saving time, cutting costs, improving products. Here are typical examples from a long list of practical applications—showing how and where you'll find Westinghouse "Electronics at Work."



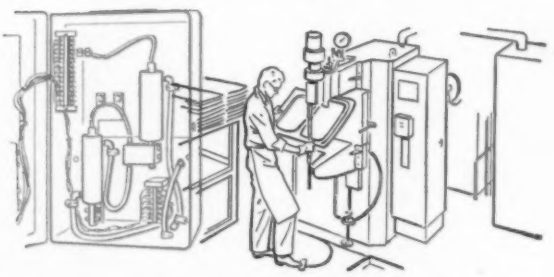
Cleaning the Air in steel mill motor-rooms is one of many applications of the PRECIPITRON, Westinghouse electric air cleaner. By trapping air-borne dust, dirt and soot—including particles as small as 1/250,000 of an inch—it prevents damaging dirt from settling in machine windings. Result: Increased operating efficiency, fewer shutdowns for maintenance.



In Aluminum Production, large quantities of d-c power are required. The Ignitron Rectifier, electronic device developed by Westinghouse, converts alternating current to direct current at *higher efficiency* than any other type of equipment. It carries rated loads continuously—24 hours a day. Because there are no major moving parts, maintenance is practically eliminated.



Highly Accurate Control of motor performance is essential for uniformity of product in the paper and other process industries. By Electronic means, more precise control of speed, voltage, acceleration, and other characteristics can be obtained. The absence of any moving parts permits maintaining the highest possible degree of sensitivity, without the necessity of frequent maintenance.



Mass-Production Welding has been made possible largely through the development of modern resistance welding techniques. By this method, metal parts are now fabricated far faster than ever before. To deliver high-quality welds of uniform strength, accurately controlled current must stab through the metal as often as 1800 times a minute. In scores of plants, Westinghouse Electronic Timers provide this precision control.

J-91007

Omaha Public Library
Reference Dept.

For further information on practical applications of Westinghouse electronic devices, write or phone your nearest Westinghouse office. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Westinghouse ELECTRONICS

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

AMERICAN Phillips Screws

★ ★ ★

HELP UNSKILLED WORKERS GET SKILLED RESULTS WITH STRAIGHT, STRONG, SPEEDY FASTENINGS

Inexperienced hands catch on quickly to the fastest, easiest, most foolproof method of screwdriving ever devised . . . the self-aligned, non-slip driving of American Phillips Screws. And in no time, new workers develop machine-gun speed that often doubles production. For with American Phillips Screws *they can't miss* . . . because the 4-winged driver and tapered recess form one straight inseparable unit, until the screw has been set up tight. And there's a perfect fastening, with no burrs on the screw head . . . no ugly gouges on the work surface. With this modern method, operators are not tired by work that wore them out, back in the slotted-screw days.

American Phillips Recessed Head Screws are made under rigid laboratory check, and a unique system of piece inspection . . . two good reasons why more and more buyers of Phillips Screws are specifying "American Screw Co. brand."

AMERICAN SCREW COMPANY

PROVIDENCE, RHODE ISLAND

Chicago: 589 E. Illinois Street *Detroit:* 4-258 General Motors Bldg.

4-POINT CONTACT MEANS FAST, STRAIGHT, NON-SLIP DRIVING

COLD-FORGED WOOD SCREWS ★ MACHINE SCREWS ★ SHEET METAL SCREWS ★ STOVE BOLTS

Air Casualties

It's bad air that does it. But you can step up production by putting a Coppus Blower on the job to keep the air moving — and keep the men cool.

The kind of air a man works in has a lot to do with how much work he can turn out.

In confined places like shipholds or tanks or drums or boilers . . . or wherever the air is stagnant or hot or full of fumes . . . a Coppus Blower is a *must* for getting first-class work out of the men, all the time.

A Coppus Blower or Exhauster helps avoid sickness and lassitude due to bad air . . . and improves morale, too.

Portable and adaptable for special purposes, Coppus Blowers and Exhausters will have dozens of uses around your plant. The "Blue Ribbon" (a blue painted band) is your assurance of quality performance at lowest cost.

COPPUS

BLUE RIBBON BLOWERS

THE BLOWERS THAT PUT MORE MINUTES IN EVERY MAN-HOUR

CABLE MANHOLE AND TANK VENTILATORS — BOILER MANHOLE BLOWERS AND EXHAUSTERS — HEAT KILLERS — SHIPHOLD VENTILATORS . . . DESIGNED FOR YOUR INDUSTRY — ENGINEERED FOR YOU

MAIL THIS COUPON To Coppus Engineering Corp., 203 Park Avenue, Worcester, Mass. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in SWEET'S CATALOG.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fusilages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets; etc., after treated with coating material.

NAME .....

COMPANY .....

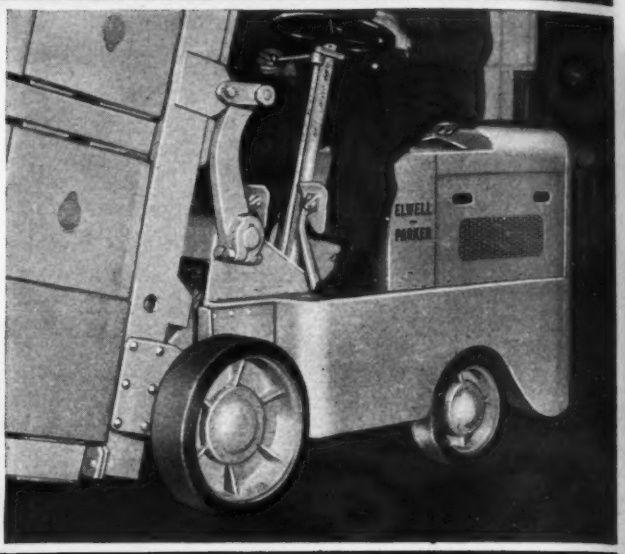
ADDRESS .....

CITY .....

(Write here any special ventilating problem you may have.)

You're Running on Your "Spares"

To maintain full-time operation of your Power Industrial Trucks, you must get *More Months from Your Present Tires*—



Keep an Eye on Your Floors!

Present indications are there will not be enough latex rubber Tires for Power Industrial Trucks. Meantime, Industrial Truck Engineers are collaborating with Rubber Company Engineers in conducting exhaustive tests on Tires made of new compounds.

You *have* to have Trucks to get war contracts out on schedule. So take good care of the Tires you are using today—they probably are your "spares" for the present.

To prolong the usefulness of your present Tires, Elwell-Parker urges you to instruct your men or women Truck Operators to follow strictly these vitally important principles. Thus you will conserve critical rubber while getting your war job done.

These rules are for your Truck Operators to heed:

Avoid broken glass, metal chips
You can gouge out chunks of rubber, ruin Tires in mere days. Look ahead of you. Keep floor clear of sharp trash. Good housekeeping pays.

Stay off the curb
Short cuts save no time. Running Tires over any obstruction not only chews up rubber but tears Tires off rims and damages the Truck.

Keep out of "chock-holes"
Avoid depressions or cracks in floor or pavement. You not only destroy Tires but soon wreck the Truck.

Don't drive through oil
Grease attacks and rapidly destroys rubber. Never drive over patches of oil or accumulated grease. Clean Tires periodically.

Truck is no battering ram. Don't try to start loads by hauling off and giving a smack—you can ruin the Truck mechanism beside tearing miles off Tires by spinning the wheels.

Wouldn't you like to place reprints of this advertisement into your Truck Operators' hands? We will be glad to send them. If interested in training women to drive your Trucks, ask for new Elwell-Parker Instruction Manual "Lady, will you give a Lift?"

The Elwell-Parker Electric Co., 4323 St. Clair Ave., Cleveland, O.

ELWELL-PARKER

POWER INDUSTRIAL TRUCKS AND CRANES

1893 ★ 1943 • The Elwell-Parker Year ★ 1943

DO YOU KNOW THAT WHITE CEILINGS AND WALLS CAN INCREASE PLANT OUTPUT AS MUCH AS 10% ?

THE FACT that a fresh coat of *white* paint on plant ceilings and walls can step up production as much as 10% is well known to many operating and maintenance men. It's a fact you can check up *right now* by calling any lighting expert of your acquaintance. He'll agree that unless your plant is properly painted, you're losing up to 60% of the light you're paying for *and up to 10% of the production your present equipment could be turning out.*

PAINT, he'll tell you, *is part of your lighting system**. You may have the finest lighting equipment money can buy, but unless it's backed up by clean *white* ceilings and walls, you're not getting all the light you need for maximum output. Faulty workmanship, heavy spoilage, avoidable accidents resulting from fatigue and poor seeing —all take a toll of vital man-hours that *white* paint could help save.

"That's fine," you may say, "but we haven't the *time* to paint!" That's where your trained BARRELED SUNLIGHT Representative comes in!

Backed by our more than 40 years of specialization in *white* paint for industry, he's equipped to recommend the materials and procedure that will get you the extra light you need with the least possible interruption of production schedules. He can even recommend industrial painting experts who often can paint an entire plant without the loss of a single production hour.

There's a type and finish of BARRELED SUNLIGHT for every need and condition — each the most practical of its kind for large industrial areas. Send for your copy of "The Right Paint for Your Plant," which gives further details on what *white* paint can do for your plant. Better still, let a trained BARRELED SUNLIGHT Representative *inspect* your plant and help you plan a painting program geared to your production needs. Write or wire to U. S. Gutta Percha Paint Company, 2C Dudley Street, Providence, R. I.

**Better Vision Institute*

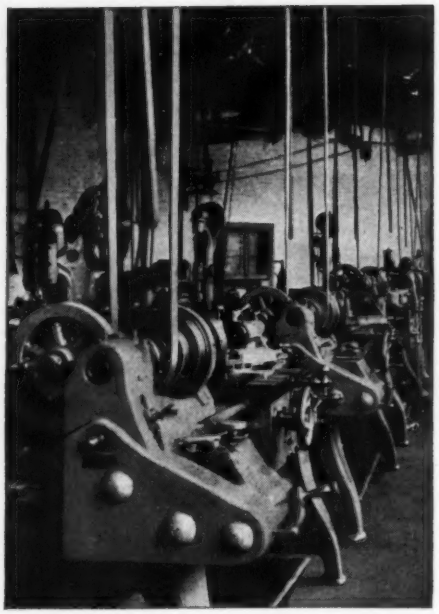
BARRELED SUNLIGHT

SPECIALISTS FOR OVER 40 YEARS IN WHITE PAINT FOR INDUSTRY

TANNATE LEATHER BELTING

BOOSTS PRODUCTION

FROM MACHINES, OLD OR NEW!



TANNATE maintains top speeds even at peak loads . . . Grips tightly, delivers more power, keeps machines running smoothly with fewer shutdowns for drive maintenance.

And, high temperatures, moisture, machine oils and many chemicals have little effect on Tannate leather belting. It will keep its grip and great strength even under severe operating conditions.

Tannate will give you longer belt life and lower yearly belt cost. . . . It will increase output and give you more uniform work, less spoilage, fewer shutdowns and reduced unit costs.

Give Tannate a trial in your plant—let it help you get peak efficiency from your machines.

J. E. RHOADS & SONS • *Established 1702*
35 North Sixth Street, Philadelphia, Pennsylvania
NEW YORK • CHICAGO • ATLANTA • CLEVELAND

STEP UP PRODUCTION WITH

RHOADS *Tannate* WATERSHED LEATHER BELTING

A Case History in On-the-Job Training

(*Continued from page 93*)

tools all right, and they did not have much to unlearn. But they wouldn't stick. As soon as they got acquainted they would look around the production departments and see other men making big money. Then they would go to our labor department and ask: "How can I be transferred to a production job?"

After all, we could not blame the lads. They knew they would be inducted into the armed forces before long, and they wanted to make as much money as possible. But we learned our lesson. Instead of making new mechanics we try now to take what we can get and make better mechanics out of them.

They are older men, these beginners in our maintenance department. A lot of them came out of the coal mines of West Virginia and Pennsylvania. Some of them—the best ones—had had experience in repairing hoists and pumps and mining machinery. Some undoubtedly were smarter than they looked; some of them we could not be sure of. We had to find out.

But almost invariably none of them had ever seen a rubber factory. They did not have the faintest idea about how to overhaul huge calenders and looms, and the other intricate and specialized machinery for washing and processing rubber, weaving cords for tires, and producing the other items our company manufactures.

So our first job was to assign these new men to work with experienced men, to let them get the feel of a rubber factory. We suspect that some of them rated their abilities plenty high in stating they were experienced mechanics and service men, but even so we have some overhauling jobs they can handle, jobs that do not need much mechanical ability.

It would be fine if we could send each beginner to a service men's school, and let him dismantle and assemble sample machines for a period of weeks or months. But we cannot take time for that. We need men too badly, and the work will not wait. So we make use of the best school there is—the factory.

Naturally, we start a new man off carefully and keep an eye on him. We cannot afford to risk the operation of the plant to unskilled hands.

There has to be a little schooling, of course. We pack it into two tight 2-hour periods. We explain to these

ATKINS

always at the service of SHELL MANUFACTURERS

who want to speed up shell stock cut-off

Find out how new high speed saws plus new cutting techniques are boosting output for shell producers . . . . . .

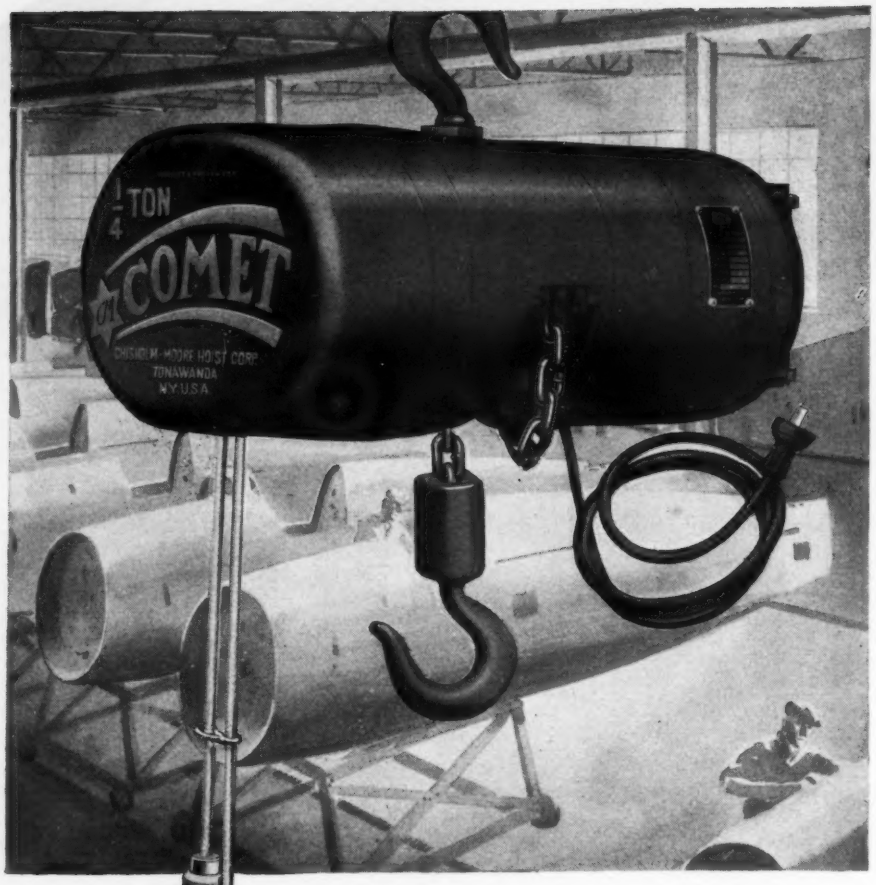
● Vastly increased output on shell stock and shell band cut-off has been achieved in many shell producing plants by Atkins engineers. By getting the *right saw* on the job and using that saw in the *right way*, cutting speeds have been greatly increased and subsequent machining operations reduced.

Basis of the new cutting speeds are Atkins Curled-Chip Saws. These modern metal cutting saws, as adapted to specific cutting jobs, permit stepped-up rates — rates nothing less than revolutionary when compared with the best of previous performance.

Call in an Atkins engineer to go over your shell cutting operations and show you exactly what can be done to save time and labor and reduce machine downtime on this vital work.

Write or Wire for Full Details

E. C. ATKINS AND COMPANY • INDIANAPOLIS, INDIANA



LIFTING
War Planes on faster schedules

The CM Comet Electric Hoist is helping aircraft and other war industries set faster production schedules through efficient materials handling in practically all stores, fabrication and assembly departments. Durable and fast, the CM Comet is being used on trolleys, monorails, cranes and as a portable unit. *Efficiently operated by new personnel.* The versatile, low-cost, CM Comet will speed-up your production schedules. Write for illustrated engineering catalog No. 138.

CM COMET

★ ★ ★

INVEST REGULARLY IN VICTORY—BUY WAR BONDS AND STAMPS

★ ★ ★

CHISHOLM-MOORE HOIST CORPORATION
(Division of Columbus-McKinnon Chain Corp.)

120 FREMONT AVENUE, TONAWANDA, NEW YORK

BRANCH OFFICES: NEW YORK • CHICAGO • CLEVELAND

new men that they hire in on a temporary basis as helpers and that the arrangement is to hold for 90 days. By that time, if they make good, they get boosted to full mechanics' pay. If they have not made good by then, they either carry on as "near mechanics" or we attempt to find other places for them.

We explain the fundamentals of all our machinery. Actually, of course, some of it is pretty involved. One day in one of our factory schools we made this suggestion.

"Think of the most complicated machine you may ever have to repair. Think then of the experience a man needs to do that repair job."

One of our most complicated machines is the sewing machine that sews button holes on Army raincoats. It takes years to train a man to service one of those sewing machines because this operation is new to us. In fact, we did not have such a repair man ourselves; we had to send back to the factory for an expert.

Preliminary Education

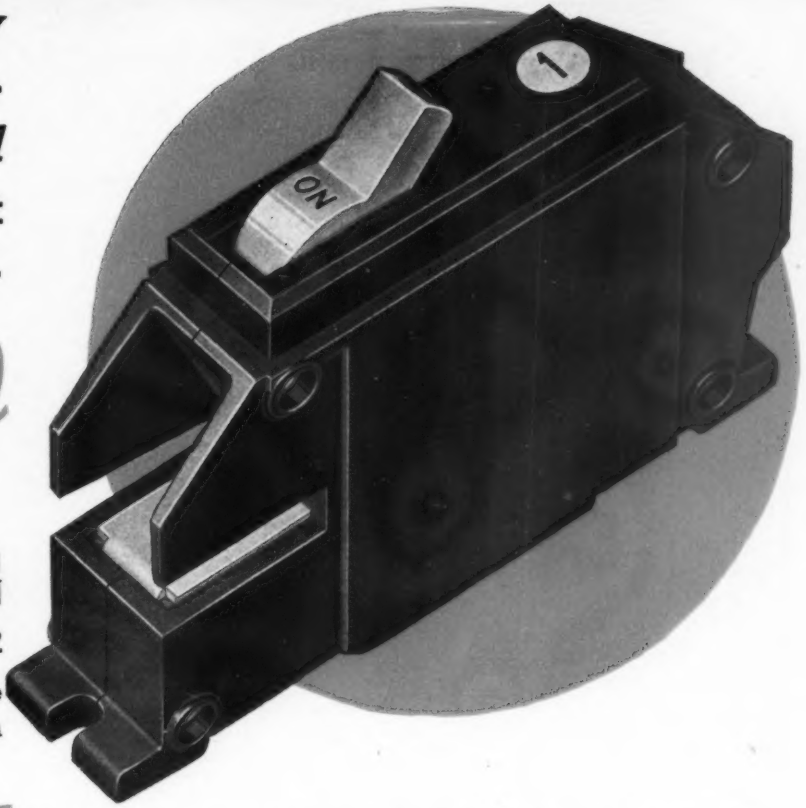
Along with this brief schooling in mechanical matters, we give timely attention to other matters that may worry a new worker. He wants to know what we are going to do with him, a new and green man. The company recognizes that many things will appear strange to him. So late in the fall we began devoting much of these two 2-hour schooling periods to matters of company policy. We explain the relations we have with the rubber-workers' union. We explain the company's system of seniority; our plans for retirement; our hospitalization; our compensation in case of accidental injuries; and we explain our suggestion system and show how it is possible to add many dollars to a man's income.

Later each new man will learn these facts more thoroughly in the actual factory, and they will mean more to him then. But right at the start we give him a quick, careful, and sincere explanation of the most important matters that will affect his working relations with our company. We set his mind at ease. This goes a long way toward getting the rough edges knocked off.

When we start these new men out we make sure that each spends a certain amount of time with older and more experienced men. Sometimes we can apprentice him, so to speak, to a veteran service man who has been with our company for years. At least, we put him under the charge of a man who has gone through the mill himself.

Just so the more experienced man will not take things too comfortably

Prevents *unnecessary* interruptions in service—but provides *full protection* against short circuit or dangerous overloads.



The *Improved*

Type AC

THERMAG

CIRCUIT BREAKER

now combines the time-delay action of the time-tested and proven THERmal trip with the fast MAGnetic trip.

ADVANTAGES of the improved Ⓕ Type AC THERMAG Circuit Breaker. (*New and improved features are shown in red.*)

1. Individual pole construction
2. Quick break on manual and automatic trip
3. Tri-metal thermal trip element for time-delay tripping
4. Magnetic trip—for short circuit instantaneous tripping
5. Handle Signal for single pole with automatic reset
6. Signal Button on double pole for trip indicator
7. Magnetic Arc Quencher
8. Line and load contacts recessed
9. Flexible connections between terminals and interior parts safeguard calibration
10. Non-welding type contacts
11. Heavier moulded sections, with air space between sections.
12. Interchangeable with original Ⓕ Type AC Circuit Breaker

The Ⓕ line of equipment for Industry includes: Busduct, Wire and Cable Duct, Panelboards, Switchboards, Safety Switches, Knife Switches, Fan Hanger Outlets, Floor Outlet Boxes, and related equipment.

On harmless momentary overload, the time lag characteristics of the thermal element prevent interruption of service, but trip on sustained, harmful overload. On short circuit, the magnetic element causes *faster tripping* of the circuit breaker.

In meeting and passing the tests of Underwriters' Laboratories, Inc., for interruption of a current of 5,000 R. M. S. Amps., at rated voltage and at 45-50% P. F., oscillograms show that a 15 Amp. Ⓕ Type AC THERMAG Circuit Breaker opened the circuit in .25 of a cycle.

When tripped, the handle on the single pole breaker automatically returns to the OFF position, thus indicating the current interruption . . . On the double pole breaker, a red signal button is protruded from the face of the breaker on which the trouble has occurred.

Ⓕ THERMAG Circuit Breakers are now furnished in all Ⓕ standard and narrow column type panelboards, and in dust-tight panelboards *at no additional cost* . . . Capacities: 50 Amps. or less, 120 volts AC, single or double pole (individual trip). Sturdy construction renders Ⓕ THERMAG Circuit Breakers, assembled in Ⓕ Panelboards, ideal for industrial use.

Installation and connection are facilitated by new and improved Ⓕ Pressure Connectors, wide gutters and ample knockouts in steel boxes. Fronts are bonderited to prevent rusting, and attractively finished in pearl gray lacquer.

EST. 1891 — THE SIGN OF A FA BETTER JOB

Frank Adam

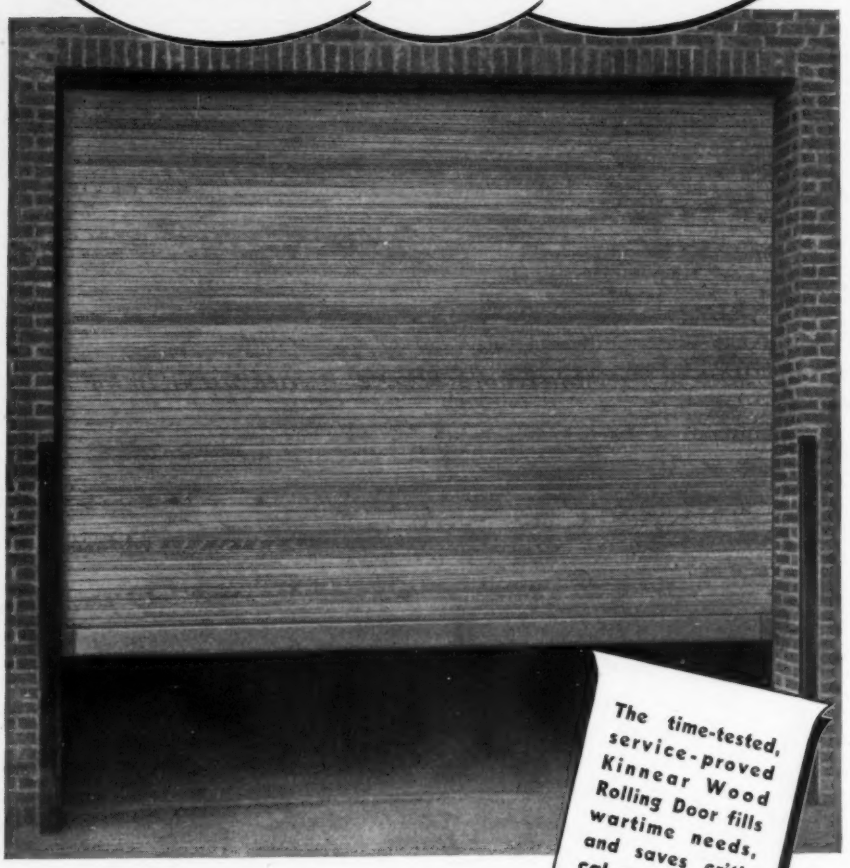
ELECTRICAL PRODUCTS

for War Industry

FRANK ADAM ELECTRIC CO.
ST. LOUIS, MO. U.S.A.

You Can Still Have the Efficiency of KINNEAR ROLLING DOORS

They're Still Available In WOOD



You can get the efficient, space-saving *coiling upward action* of Kinnear Steel Rolling Doors in spite of wartime contingencies—in Kinnear Wood Rolling Doors. Their durability and service has been thoroughly proved on numerous installations for many years!

Constructed of inter-lapped wood slats jointed with metal cables or tapes, they coil above the opening, remain out of the way and out of reach of damage, require no usable floor, wall or ceiling space for either storage or operation. The rugged curtain assembly offers a high degree of protection, and blocks out wind and weather. Kinnear Wood Rolling Doors are available in any size, with motor, manual or mechanical operation. Make sure of full door efficiency by specifying Kinnear Wood Rolling Doors for today's needs. Write for bulletin 37, containing complete details.

THE KINNEAR MANUFACTURING COMPANY
1540-60 FIELDS AVE. COLUMBUS, OHIO

SAVING WAYS IN DOORWAYS — KINNEAR ROLLING DOORS

and let this new helper continue as a helper, we tell him, "When you can assure us that John can go alone, let us know. We hired him as a mechanic, and it's up to you to turn him loose as soon as he's ready.

Sometimes it does not take 90 days to find out that a new man is as good as he says he is. Now and then we get that answer inside of 30 days. Then we put him up to his full rate immediately.

Whatever the original decision after the first 90 days, we review all beginners every three months. That makes sure that nobody stagnates as a helper, through any fault of ours. Now and then a man prefers to remain as a helper, even at less pay, rather than to accept promotion, because the risks are smaller and there are fewer worries. But that does not happen often.

In the event that a man develops faster than we have noticed, someone else is apt to report him to us. It is this way: Beginners are started out on the day shift, where we can help them more easily. We plan to leave them there only as long as they are learning. Then, under our seniority rules, they have to take their place on our graveyard shift, from midnight to morning. Some of our oldest workmen come to enjoy and actually to prefer this shift, because it gives them daylight hours to work in their gardens. Some women, oddly enough, prefer the midnight shift, because it permits them to welcome their children home from school and prepare the family supper, come to work at midnight, and still get home in time for breakfast. They can sleep then during the hours when the children are in school.

Prefer Day Shifts

But the average workman has a dislike for sleeping days and working nights, because he has to change over the habits of a lifetime to adjust himself to this new schedule. It is only reasonable, therefore, that the daytime jobs should go on a basis of seniority. So when a man who is working nights sees that a newcomer, temporarily on the day shift, is ready for promotion, he does not let us forget that he wants to get back on days.

Riggers are usually divided into crews or teams of four men—one new man and three older men. It is easy to take in a new man on that basis and in that proportion. He can begin to help, and he cannot do much harm while he is still learning.

The riggers' leader keeps an eye on the new man and reports on him. So also does the shift foreman.

Upgrading goes on all the time. We want to promote a man just as rapidly as he shows us we can have

no "A.W.O.L."s here

WESTINGHOUSE NOFUZE BREAKERS ARE ON ACTIVE DUTY—

mobilized to protect war circuits

Absent? Yes. Absent for the duration from peacetime applications because the Westinghouse production of Nofuze Breakers is devoted to war requirements.

But far-reaching improvements are resulting from this wholehearted participation. For example, in the new line of "F" Frame Breakers, all ratings from 15 to 100 amperes have been redesigned into one compact frame size. Instead of 14 different models, 4 now serve the same purpose.

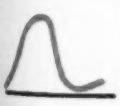
In a typical panel, the new breaker results in a saving of 38% of the steel and 18% of the copper over present panels. And although the new breaker is smaller and weighs less than half of some of the superseded units, it has better performance.

Westinghouse engineering facilities have been placed on a broad consulting basis to help with the job of protecting vital war circuits from unnecessary interruptions. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pennsylvania.

J-60522

NOFUZE "DE-ION" BREAKERS

prevent *harmless* overloads from interrupting war production.



protect circuits from *dangerous* overloads and "shorts".

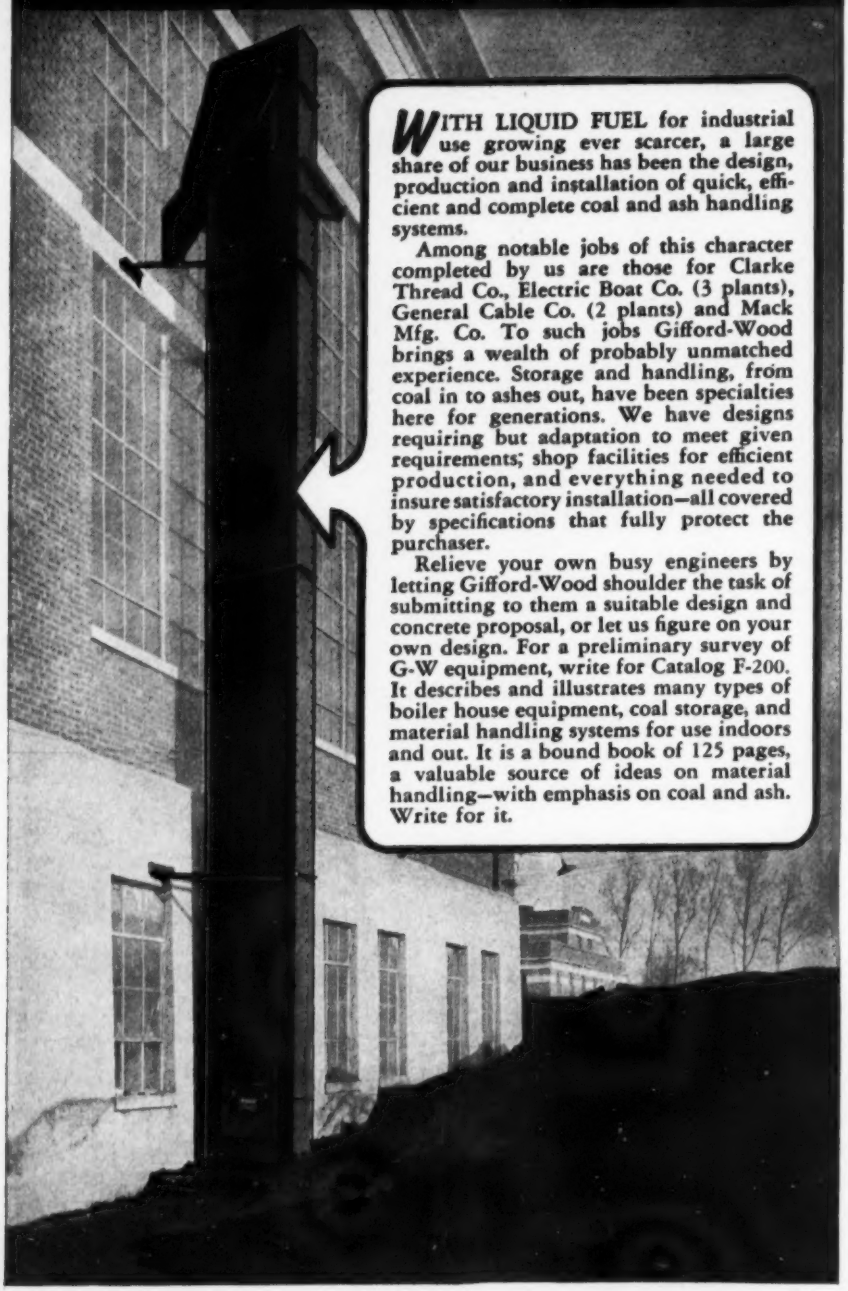
restore service *instantly* with just a flip of the switch.

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

NOFUZE CIRCUIT PROTECTION

For QUICK CONVERSION to COAL come to GIFFORD-WOOD



WITH LIQUID FUEL for industrial use growing ever scarcer, a large share of our business has been the design, production and installation of quick, efficient and complete coal and ash handling systems.

Among notable jobs of this character completed by us are those for Clarke Thread Co., Electric Boat Co. (3 plants), General Cable Co. (2 plants) and Mack Mfg. Co. To such jobs Gifford-Wood brings a wealth of probably unmatched experience. Storage and handling, from coal in to ashes out, have been specialties here for generations. We have designs requiring but adaptation to meet given requirements; shop facilities for efficient production, and everything needed to insure satisfactory installation—all covered by specifications that fully protect the purchaser.

Relieve your own busy engineers by letting Gifford-Wood shoulder the task of submitting to them a suitable design and concrete proposal, or let us figure on your own design. For a preliminary survey of G-W equipment, write for Catalog F-200. It describes and illustrates many types of boiler house equipment, coal storage, and material handling systems for use indoors and out. It is a bound book of 125 pages, a valuable source of ideas on material handling—with emphasis on coal and ash. Write for it.

3655

GIFFORD-WOOD CO.

FOUNDED 1814

420 Lexington Avenue
New York

HUDSON, N. Y.

565 W. Washington Street
Chicago

Ash Spouts • Barge Unloading • Bins • Boiler House Equipment • Buckets • Bunkers • Carriers • Chutes
Conveyors • Crushers • Elevators • Feeders • Gates • Ground Storage Systems • Hoists • Hoppers
Infra-Red Drying Systems • Screens • Silo Storage Plants • Tanks • Weigh Larries

confidence in him. Every beginner graduates from the temporary starting rate to the full rate just as early as we can trust him to be worth that figure. Sometimes a man may be a slow learner and may miss the first 90-day promotion, but we pick him up later. Things are moving rapidly. No one gets buried if we can help it.

Certain maintenance men are permanently stationed in some departments where machines are so critical that they must be kept in constant operation. Instead of waiting for something to break, we have mechanics who walk around and listen and watch. These men are constantly inspecting. They come to know the sound each machine makes when it is operating properly, and to detect any variation that indicates improper wear or something off balance, or any kind of mischief or potential trouble. Machines actually talk to their "trainers."

These department mechanics have what we call maintenance stations. Each is equipped with a bench and vise, a drill press, and a grinder. Each station has the necessary spare parts for the machines in that department.

For instance, we have a large printing department. Printing presses are not the same as our rubber machinery —for making automobile tires, or rubber tracks and treads for Army equipment, or lawnhose, or firehose, or hospital rubber goods, and so on. The parts are not interchangeable with any of our production machines. And printing presses are expensive and complicated.

Keeps Presses Running

Naturally, we station a permanent repair man in our printing department. His job is to keep things running without any breakdown. He writes his own rules, to some extent. Like a fireman in a city fire department, he may seem to be idle part of the time but actually he is planning and thinking how he may keep his machines in good working order. But he cannot leave that department. For the most part he keeps busy servicing and making minor adjustments and repairs, so that no serious incident can happen.

Our company has a good many of these resident men. They may be assigned to any department that feels it can "afford" a full-time mechanic. This decision must be okayed by our production department, and is based on the amount of repairs that were needed when the department did not have a service man right on the spot. This change means that 100 percent of that man's time will be charged to this one department. It can be expensive in pay and expensive in men, and not every department needs or can

Today . . . Every Benjamin activity . . . everything Benjamin manufactures . . . is designed to contribute to the Winning of the War.

Helping Plant Personnel TO SEE BETTER is an important part of our WAR TASK

How Good Lighting Helps Solve Many Manpower Problems

Leaving the day's work with the minimum of fatigue is an essential to sustained efficiency on the job. Especially is this important to those women employees who must leave their war jobs with sufficient energy reserve to carry on their homemaking tasks cheerfully and without endangering their health.

Good Lighting helps to make the job easier and less tiring because seeing requires time and energy. The better the light, the less the strain on the eyes and the less the drain on the energy reserve.①

Reduces Accidents

Fatigue, also, is the enemy of alertness against accidents. Improvements in lighting effect reductions in the accident rate.② For adequate lighting and the right kind of lighting system enables employees to see faster, more accurately and with less effort.

Better light . . . better seeing . . . extra energy . . . summarize the benefits of Good Lighting. These good lighting benefits have been demonstrated by scientific research and laboratory tests and corroborated by the current experiences of industrial plants throughout the country engaged in war production.①

The right kind of lighting requires the selection of lighting units which will provide the proper amount, direction, diffusion and distribution of light and which will minimize glare.③

Free Lighting Guide

How to secure such lighting for your plant is outlined in the Benjamin guide "Specifications for Productive Lighting in War Plants." You may secure, without cost or obligation, a copy of this guide together with a copy of the new I.E.S. report "Value of Good Lighting in War Production." Write today to the Product Information Department N, Benjamin Electric Mfg. Company, Des Plaines, Illinois.

① See Booklet, "Value of Good Lighting in War Production" just issued by the Illuminating Engineering Society which contains laboratory findings and a cross section of industrial plant experience with lighting in war production. Also, booklet, "Plant Efficiency," published by the War Production Board.

② See "Safe Practices" Pamphlet, No. 22, National Safety Council.

③ For further data on this important subject, send for free copy of booklet "Benjamin Specifications for Productive Lighting in War Plants."

BENJAMIN

LIGHTING EQUIPMENT

BENJAMIN PRODUCTS

INDUSTRIAL LIGHTING EQUIPMENT *including fluorescent, incandescent and mercury lamp units*

EXPLOSION-PROOF UNITS

DUST-TIGHT UNITS
VAPOR-TIGHT UNITS

FLOODLIGHTING EQUIPMENT

MARINE LIGHTING EQUIPMENT

MARINE WIRING DEVICES

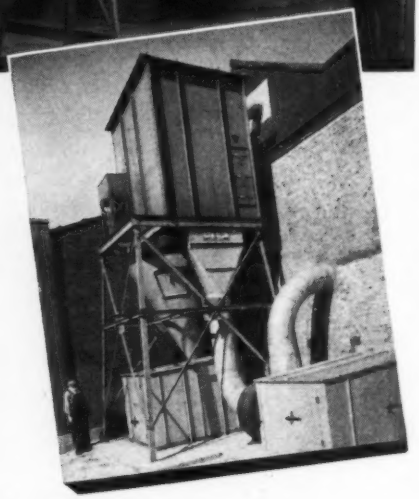
★

SOCKETS AND OTHER WIRING DEVICES

★

SIGNAL EQUIPMENT *including Sirens, Horns, Buzzers and Telecode Relays*

ENGINEERED to the requirements of MODERN PRODUCTION



KIRK & BLUM

DUST CONTROL SYSTEMS

are doing two good jobs for a leading lathe manufacturer

Our assignment for this machine tool plant was to eliminate the saw-dust and wood-shavings in the pattern shop, also the fine metal-dust in the castings grinding department. This called for the installation of two separate systems.

A Down-Draft System using Roto-Clones with specially designed "After Cleaners" made by American Air Filter Co. Inc., was installed in the castings grinding department. Metal-dust from grinders is exhausted through floor and bench gratings into under-the-floor ducts, saving much needed space.

In the pattern shop, a flat screen-type cloth filter with cyclone precleaner is used as the dust collecting medium. Not only are the wood-shavings and saw-dust collected, but the air is returned to the building without heat loss and dispersal of dust on adjoining property is avoided.

In selecting different dust collecting media, we adhered firmly to the Kirk & Blum policy of making unbiased recommendations as to the best type for the individual job.

For efficiency and dependability in dust control — Consult KIRK & BLUM.

Send for any of the following Booklets:—

"Dust Collecting Systems in Metal Industries"
"Fan Systems for Various Industries"
"Blower Systems for Woodworking Plants"
"Industrial Ovens"
"Cooling Systems for the Glass Industry"
"Data on Kirk & Blum Production Facilities"

THE KIRK & BLUM MANUFACTURING CO.
AN ORGANIZATION OF ENGINEERS AND MECHANICS
2835 SPRING GROVE AVE. CINCINNATI, OHIO

justify a resident mechanic. But when such a change does prove advisable it generally saves the company money in future repairs as well as in delays to production.

Resident mechanics are not unique with us; they probably are general to all industry. Resident mechanics here can be pipefitters, machinists, millwrights, or electricians.

These resident men are separate from our flying maintenance squad, which looks over several different groups of machines, including the departments not big enough to have a permanent mechanic. These mechanics have to be carefully trained, and resourceful.

Pull From the Pool

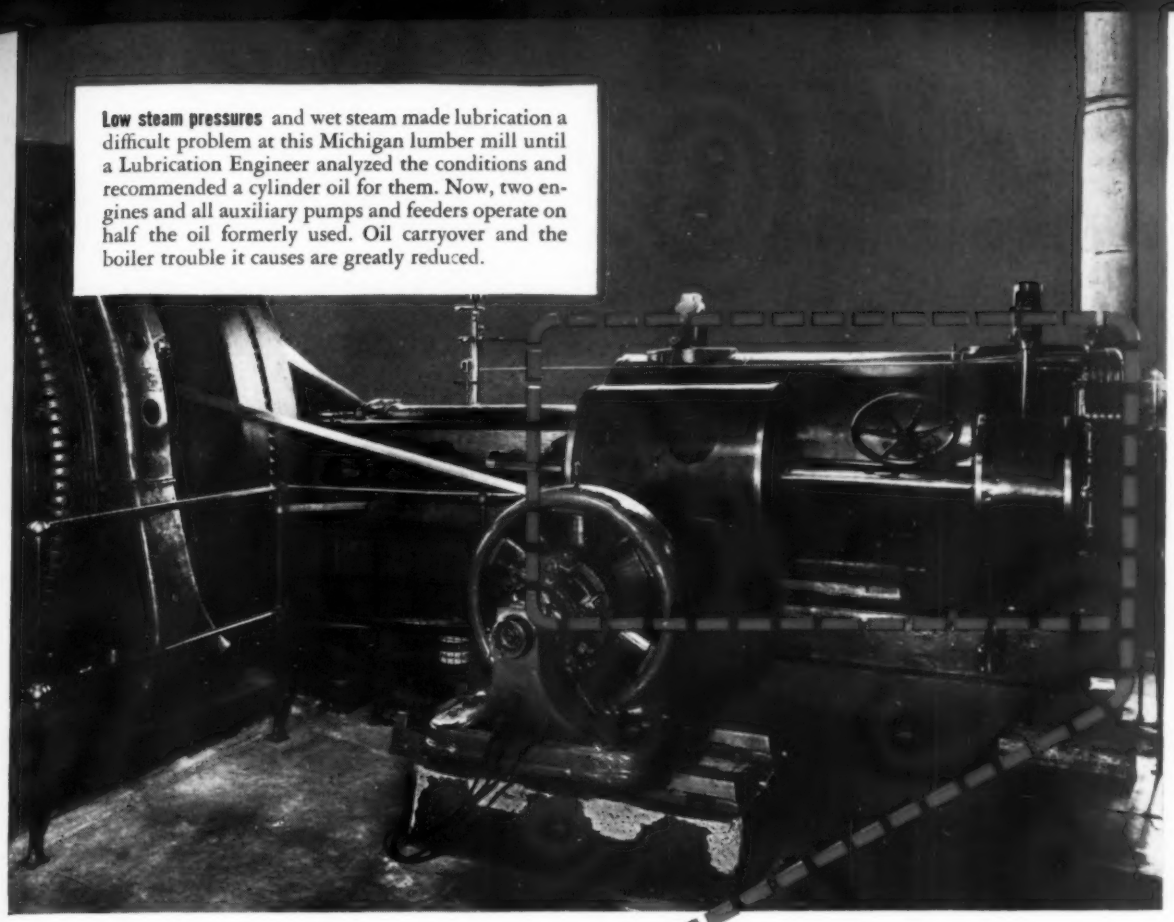
For emergencies, such as any general breakdown, we pull from our pool. We have a central maintenance station with a large squad of trained men operating out of it. If a resident mechanic gets into trouble—if more than one or two machines are down—he sends for help from the pool.

When we close down a department for the week end and repaint and overhaul everything in that department, as occasionally we are able to do, we may augment that department's normal repair force with men from other maintenance stations or our main shops. For instance, we shut down most of our plants for two days over New Year's, and did a lot of important overhauling at that time. This was a terrific job and we had to lay out the program carefully in advance.

You have to squeeze extra minutes out of the clock to crowd in any servicing, when the war program calls for most of our departments to operate without shutdown, seven full days a week. Some of us have an idea that machines cannot run properly without rest, any more than a human being can run properly without rest. But we do the best we can.

Sometimes, instead of servicing one machine at a time, we overhaul a whole department—not just our big New Year's overhauling, which of course is exceptional, but any normal production department. Suppose a key machine needs tuning up. It will take maybe two days to put it back in trim. There isn't much point in operating the rest of that department if the one key machine is quiet. So the superintendent closes down the whole department for a total overhauling. That will boost his repair bill for that period, but will save him a lot of headaches and possible breakdowns in the months ahead.

We impress each foreman with the cost of repairs and try to get his help in holding down expenses. This is a



Low steam pressures and wet steam made lubrication a difficult problem at this Michigan lumber mill until a Lubrication Engineer analyzed the conditions and recommended a cylinder oil for them. Now, two engines and all auxiliary pumps and feeders operate on half the oil formerly used. Oil carryover and the boiler trouble it causes are greatly reduced.

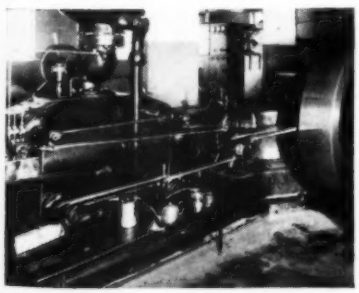
Assure needed power for war loads

THERE'S little stirring military action about the plants pictured here. But the extra power to produce the machines of war must come from plants just like these, and yours. That power must not fail for any reason—particularly not from improper care or lubrication, because it is so simple to make sure that lubrication is not the cause.

You can't make a better first step than to reexamine your whole problem of steam engine lubrication—your lubricants and lubricating methods. See where they might be affected by the new demands on equipment—the longer hours of operation, and heavier loads. Look at consumption records, for example. Increased consumption may indicate increased wear.

As a double check, let a Standard Lubrication Engineer work with you. He's helped many plants facing war power demands. He's had a chance to see where troubles strike first. He may have many helpful suggestions for you.

If you don't already know the Standard Oil Engineer in your locality, call the nearest Standard Oil (Indiana) office, or write 910 South Michigan Avenue, Chicago, Illinois, and ask to have a Lubrication Engineer stop at your plant.



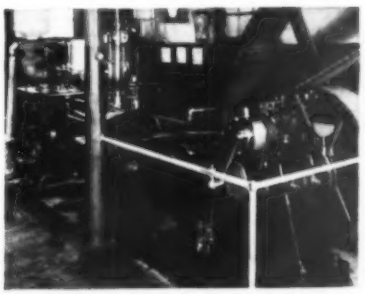
Since the last war when the 200 H.P. engine (above) was switched to a Standard steam cylinder oil, operation has been almost continuous, with little or no maintenance. The cylinder has never been rebored and rings have been replaced only once.

★ ★

STANDARD STEAM CYLINDER OILS

★ ★

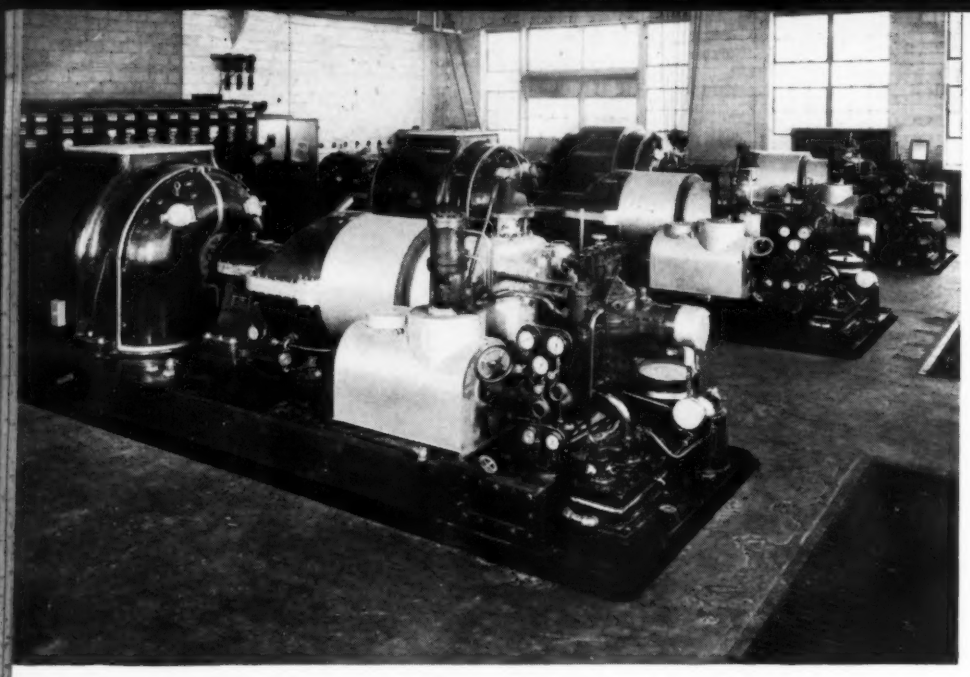
Oil is Ammunition . . . Use it wisely



Millwork for defense housing is this plant's job. An analysis of steam pressures and loads, and a thorough check of feeds for adequate cylinder and valve lubrication led to a recommendation of Stanocyl Cylinder Oil. This has kept this engine free from all lubricating trouble.

STANDARD OIL COMPANY (INDIANA)

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION



Records made on the three turbines above show how clean turbine oil systems stay with Nonpareil Turbine Oil.

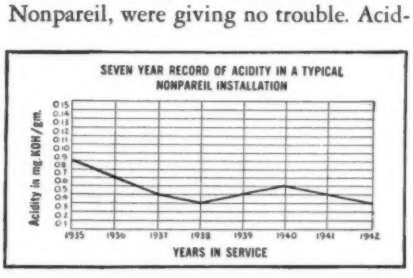
Service record shows how to get cleaner turbine operation

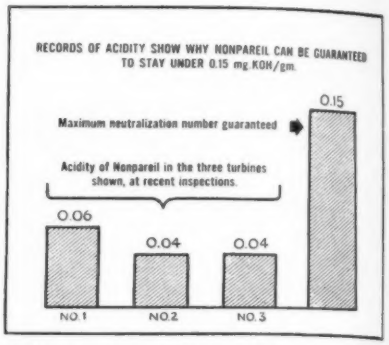
● A comparison of turbine oil operation is difficult to make. Conditions vary from plant to plant. The type of turbine, and operating practices and needs affect oil performance. But here is a case where conditions were, as nearly as possible, identical—where the performance of an oil that is fully protected against acidity and sludge formation could be fairly rated in direct comparison with a conventional oil.

Here are the conditions. The three 1500 KW turbines in a middle western power plant, shown above, are the same make. All operated eight years on Nonpareil Turbine Oil. All maintained an excellent record for low acidity and cleanliness. Then, for reasons not connected with the oil, the No. 3 turbine (extreme right in the picture) was filled with a conventional oil. And troubles started popping. Bearing temperatures rose. Sludge clogged oil screens. Oil had to be centrifuged continuously.

Another turbine was tried. When the troubles continued, it was thought that some mechanical difficulty in the turbine might be the cause. At the yearly overhaul period, No. 3 turbine was put back on Nonpareil, and turbine No. 1 was filled with a new batch of the conventional oil. The troubles switched over to No. 1. Bearings overheated; screens clogged and had to be cleaned every 60 days.

Back to normal. In the meantime, turbine No. 2 which had operated continuously, and No. 3 which had been refilled with Nonpareil, were giving no trouble. Acidity was low, and screens and coolers were cleaned only at the yearly inspection period. That was enough evidence for this operator. Nonpareil Turbine Oil is again in all three units.





Acidity control in Nonpareil. The low acidity of Nonpareil in the three turbines, as shown by the figures above, is obtained by the use of a *patented* inhibitor which is added to a highly refined oil from which the asphaltene-forming hydrocarbons have been removed. This also accounts for the unusually clean operation secured with Nonpareil. Its neutralization number is *guaranteed*, in writing, not to exceed the low limit of 0.15 mg.KOH/gm. for the life of your turbine.

COMPARISON OF SERVICE REQUIREMENTS BETWEEN NONPAREIL AND COMPETITIVE OIL

Noted during the period when turbine No. 1 was operating on a competitive oil and turbine No. 2 was operating on Nonpareil.

	Nonpareil	Other Oil
Oil Centrifuged . .	Every 30 days	Continuously
Screens cleaned . .	Yearly	Every 60 days
Oil replacements .	None	Yearly
Bearing temp. . .	140°—145°	160°—165°

Get all the facts. A Standard Lubrication Engineer can tell you many other operating advantages of this patented type of turbine oil. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska, at Omaha.

★ ★

NONPAREIL TURBINE OIL

★ ★

OIL IS AMMUNITION . . . USE IT WISELY.

STANDARD OIL COMPANY (INDIANA)

human way to attack the repairs problem. We do not know any more direct or more convincing argument than the appeal to a man's own pocketbook. If a foreman has too heavy an expense for repairs, it affects his chance for a bonus. It's as simple as that.

Every foreman is told month by month what his repairs are to date, and how they compare with last year's. When some unusual breakage occurs we explain it to him; perhaps it is something that had to happen, and at least it may be nonrecurring. We want him to understand that some repairs are necessary and unavoidable, but that frequently big repair bills can be dodged by taking sensible steps regularly and early.

We do not want a foreman to skimp on repairs, just to hold the bills down and save him his bonus. That would be short-sighted thrift. To guard against this, our own service men work along with the foreman to find little troubles before they become big repair jobs.

Still Much to Be Done

We do not claim to have found all the answers to our problems yet. Maintenance is a big job. It is an unexciting job; unexciting to outsiders, at least. Most workmen would rather scrap a piece of old machinery and give their affections to a new one. Once upon a time we felt that way ourselves. But in these times we have to do a lot of things we used not to take the trouble to do. We occasionally have to rebuild and keep in repair some equipment that was ready for an old-age pension long, long ago. We have to take unskilled mechanics and help them grow to be useful mechanics and repair men. We have to convince them and convince our production men that maintenance at this time is fully as important as any job in the factory. Without proper maintenance, wheels do not move. It is as fundamental as that.

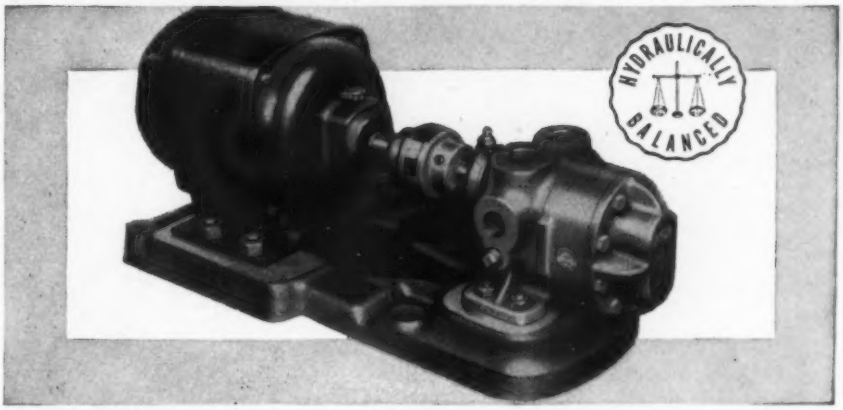
Car-Sharing Plan Conserves Tires, Gas

(Continued from page 107)

cord any changes that may develop. This card is used also as a check against the rider's securing supplemental gasoline, if his riding agreement with the driver can still be maintained, of course.

In addition to the above, the tools proving most useful to the department have been maps obtained from

"You Can Rely on Roper"



Why the Roper Pumping Principle Has Earned Top Ranking

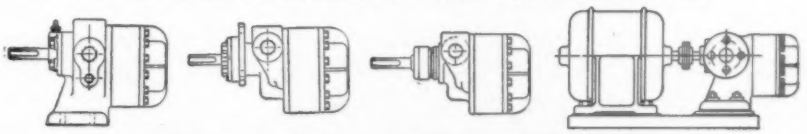
The Roper Principle is the simplest ever designed. Only two moving parts . . . *equal size pumping gears* . . . operating in a case with proper clearance so there is no perceptible wear on case or gears.

Roper Pumps, quiet and smooth in operation, do last longer because of their simplicity and because internal pressure is equalized at all points. Pumping gears actually float in operation, being entirely separate from the drive shaft and connected by a smooth, sliding joint which absorbs all shock and thrust.

Another good design feature . . . gears and bearings can be inspected without disturbing piping or power. Type of gears optional . . . Spiral Gears for applications requiring high efficiency and practically silent operation at high speed . . . Spur Gears for higher volumetric efficiency at maximum pressure.

Custom-Built Performance from Standard Models

Capacities from one to 1000 gallons per minute . . . pressures up to 1000 lbs. per square inch . . . speeds up to 1800 r.p.m. . . . 21 drives and mountings . . . eight piping arrangements.



ROPER

Rotary Pumps

Write for Catalog 938. It contains a summary and a digest of valuable information on pumps and pumping problems.

GEO. D. ROPER CORP., ROCKFORD, ILL.

"You Can Rely on Roper"

How DEVOPAKE hides and covers any surface *in just one coat!*

WONDERFUL how Devopake **cuts** costs . . . **saves** manpower. School commissioners in a large city (name on request) have reported that Devopake saved them $10 a room in painting costs. **High hiding power** of Devopake saved washing down of walls beforehand, and applying of an undercoat. **Spreading quality** of Devopake cut gallonage from former 5 gallons to a room to 2¾ gallons. **Easy brushing** quickened time of application . . . **saved** man hours.

No maintenance man has to go to school to figure out that lesson. For his next job . . . he will specify Devopake and let this **self-sealing primer and finish coat in one** save time on the job, with minimum interruption to essential activities. He will continue to cash in on its long wear that stands many washings. Use Devopake and enjoy the reflection and diffusion of maximum available light that this truly flat wall finish insures. Devopake now comes in **7 practical colors.**

Specify Devopake on your next paint job and save time . . . save money . . . enjoy complete, guaranteed satisfaction.

Devoe's maintenance paint line is built to meet all your requirements including high resistance to fungi, fumes and moisture.

Write us today for complete information that can help you solve your maintenance paint problems.

DEVOE & RAYNOLDS CO., INC.

The 189th Year of the Oldest Paint Maker in America

FIRST AVENUE AT 44TH STREET, NEW YORK, N. Y.

county and city engineers; tires and gasoline rationing regulations and guides, and gasoline rationing mileage charts obtained from rationing boards; and *Victory*, the official weekly bulletin of the Office of War Information, obtained from the Superintendent of Public Documents, Washington, D. C. Indispensable, too, is a goodly supply of OPA forms such as the Tire Record and Application for Basic Gasoline Ration, Application for Supplemental Gasoline, Statement of Appeal, Affidavit for Replacement of Gasoline Ration, Application for Supplemental Gasoline Renewal, Application for Tire or Tube, Application for Special Gasoline Ration, and Application for Adult Bicycles.

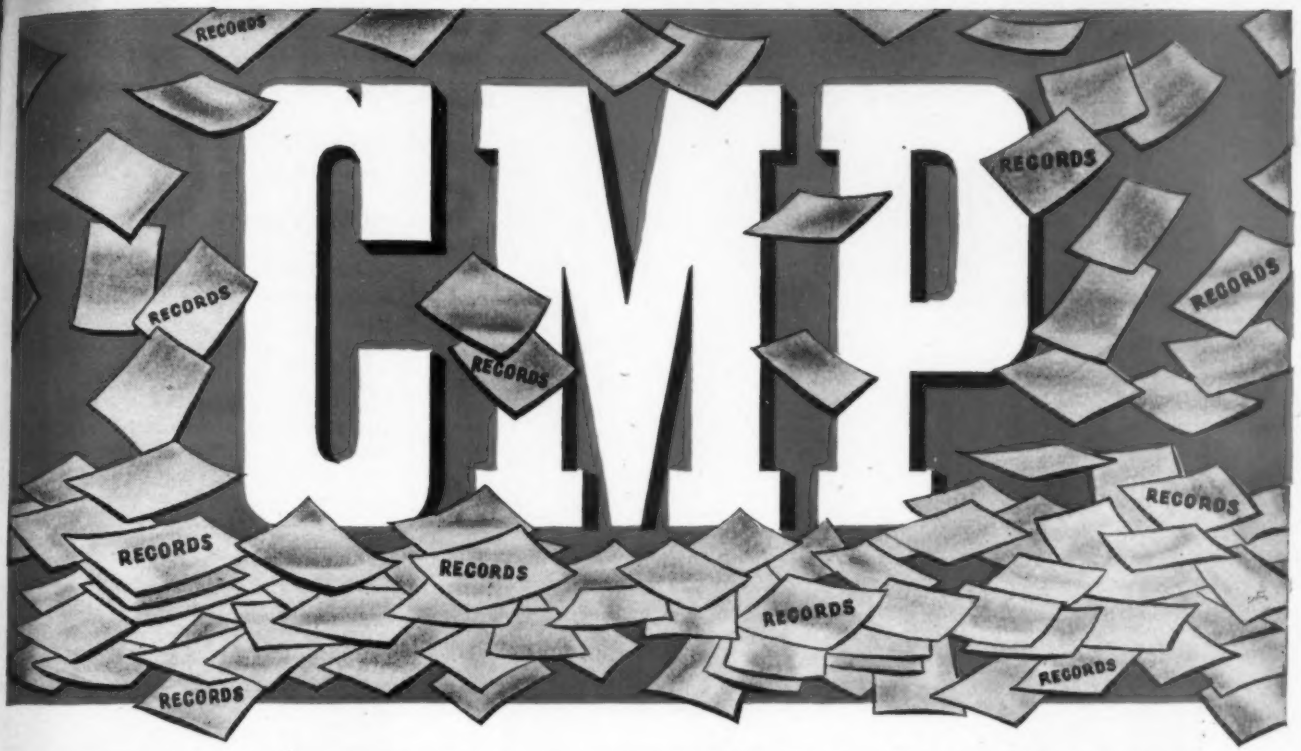
Poster Appeals

A general educational and publicity program was adopted to combat the general lack of understanding of the rubber situation and the overall transportation problem. Enlarged photostatic copies of charts showing the rate of tire wear at various speeds were posted on bulletin boards. Beside them were posted cartoons aimed to enlist support of the share-a-car movement. Posted, too, were appeals such as:

"Your automobile, its tires, and the gasoline you need to make it run should no longer be looked upon as a luxury. Nor even as a convenience. Either you need it or you don't. If you don't have to drive it, DON'T. If you do need it, then look upon it as a precious, irreplaceable tool that is indispensable to you, your job, and the war effort. Today, gasoline and tires and cars are more valuable than money. You can earn more money but you cannot replace used rubber and gasoline. That has been burned up forever. You have a sacred obligation to get every last mile out of your tires and to make every drop of gasoline work for you."

Paying Dividends

The establishment of the transportation department seems to be paying dividends. Buses operating to and from the plant are filled to capacity on the first shift and are nearly filled on the other shifts. The number of private cars in use has been greatly reduced. Those which do remain in use, and there are more than 2000 of them, are averaging near-capacity loads. Because of the efforts made by the department toward conservation, the war price and rationing boards have granted requests for rationed transportation items with little or no delay. This has helped considerably in keeping car-sharing plan running smoothly.



POSITIVE RECORD CONTROL IS ESSENTIAL

TO assure management of materials under the Controlled Materials Plan. Cardineer will give you that control. In addition, Cardineer speeds posting and finding over 60%. Work is easily divided for peak loads. Mobile unit may be moved anywhere in the office. Records paraded before the eyes of the operator with an easy touch of the pull ring. Eliminates fatigue. Assures greater accuracy.

You can put Cardineer to work now! Because it is made of non-critical materials, Cardineer is available for immediate delivery.

Cardineer with its many advantages can assist you in solving your CMP and inventory problems. Address our Methods Division, Department F-3, today, for assistance. No obligation.

ASK FOR YOURS. Booklets in time-money saving are free as follows; check and pin on your letterhead: Inventories ☐, Costs ☐, Payroll and Personnel ☐, Plant and Equipment ☐, Purchases ☐, Production ☐.

DIEBOLD SAFE & LOCK CO.

General Offices: Canton, Ohio

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DIEBOLD *Cardineer* **ROTARY FILE**

DARNELL
Casters & Wheels

Choose just the right caster or wheel for your needs from the Darnell line of nearly 4000 types. These precision made casters and wheels will help you speed up production . . . will pay for themselves many times over. Investigate today!

KEEP 'EM ROLLING

FREE Manual FOR THE Asking

DARNELL CORP. LTD., 60 WALKER ST. NEW YORK, N.Y.
LONG BEACH, CALIFORNIA, 36 N. CLINTON, CHICAGO, ILL.

How Handicapped Workers Fill Manpower Needs

(*Continued from page 111*)

spine curvatures; 101 have organic heart ailments.

Altogether 11,652 men, in various stages of disability, are receiving full pay. The blind men, for example, receive 95 cents to $1.15 an hour.

None of the men is regarded, or has reason to regard himself, as receiving any favor. It is distinctly understood that this is neither charity nor altruistic humanitarianism. Each one of these workers is expected to give, and does give, full value for his wages.

The assistance that the Ford personnel department rendered in these cases was to determine which job could be filled best by persons lacking the use of some of their normal physical abilities.

Louis Gunther, blind, has handled various jobs, including spot welding, at RCA Victor. His present job is to keep materials moving at the Camden plant

Blind men, for example, are used in fitting parts together and passing them along a line into boxes where they are carried to departments for insertion into motors. This is only one of the things they do. Any job where touch and practice are the major factors to be considered and where no dangerous machinery is present is suited to sightless men, Ford says.

The company alone is not responsible for the success of the sightless men. Their fellow-workers are highly cooperative. When any handicapped person, especially one who is blind,

FOR SALE—ELECTRONIC PRODUCTION AIDS

Have you automatic paint sprays for conveyor lines? Install G-E photoelectric relays to control paint sprayers. They save paint by using it only when object is in exactly the right spot or area; make every unit the same. Bulletin GEA-1755C for details.

HOW BLUE IS SCARLET?

Paint, pigment, dye manufacturers need to know how to match colors perfectly. G-E electronic recording color analyzer does the job. Gives you a complete, accurate, permanent "curve of color" on any of two million shades and tones in two minutes. Helps control manufacturing processes; aids in chemical analysis. Used as basis for ASA war color standard. Get more information in Bulletin GEA-3680.

To Measure Actual Strain in Structural Parts

Now you can check calculated stresses with actual measurements. Improve design, save materials. One railroad saved literally millions of dollars in new construction by reinforcing its bridges to carry increased loads. G-E electronic equipment and electric strain gages enabled them to make this saving. A real electronic tool for the structural engineer. Bring us your problem—bridge, building, airplane, crane, locomotive, or what have you. Ask for Bulletins GEA-3673 and GEA-2543.

HOW TO SAVE ON A-C RESISTANCE-WELDER MAINTENANCE

Replace mechanical contactors with G-E electronic contactors. No moving parts! No tips to dress. No noise. No open arc. No time-lag. Faster production. Electrodes last longer. Timing more exact. Use long-life G-E ignitron tubes. Installations usually pay for themselves in short time. One user, with 156 tubes installed, reports only three tube failures in two years! Act now! Bulletin GEA-3058B gives more information.

DO YOUR WORKMEN SQUINT

WHEN DAYLIGHT DIMS? ***G-E electronic light control turns on factory lights whenever daylight level is too low—turns them off when daylight is sufficient. Saves eyes, helps maintain production, saves power. Many other uses. Low cost. Bulletin GEA-2679B gives installation information, diagrams.***

DelicateTiming!

Standard G-E electronic timers go down to 0.045 second and up to two minutes; five ranges to choose from. Special ranges on request. Consistent. Stepless time range controlled by knob on front. Only one moving part. Only one tube. Used to time resistance welders, induction furnaces, conveyors, laboratory operations, and many other applications. Thousands in use. 110 or 220 volts, a-c. Price, $28 and up. Bulletin GEA-2902B.

MACHINE-TOOL USERS!

You can change machine-tool speed instantly with new G-E Thy-mo-trol. This electronic motor control gives you complete motor speed range on a single dial—small as a radio volume control. Thy-mo-trol starts, stops, accelerates, controls speed, and protects the motor. Operates d-c motor on a-c power. Compact. No moving parts. No vibration. Saves operator's time. Users report increased machine output and longer cutter life. Get free Bulletin GED-972A.

IS YOUR METAL-STRIP PRODUCTION LEAKING OUT THRU PINHOLES?

Are pinholes in your rolled-sheet stock causing rejects, complaints—slowing up war work? Catch them, before they get into the stock pile, with G-E electronic pinhole detector. Finds and marks pinholes only 1/100-inch in diameter at 750 to 1000 feet per minute. Operates shear to cut out faulty areas. A real wartime production aid. Ask your G-E representative for the whole story. Get Bulletin GEA-3530.

You lose truck and operator time whenever drivers stop to open doors manually. G-E electronic control opens and closes motor-operated doors automatically—without stopping trucks.

One manufacturer saves $30 a day in time and heat.

Don't waste valuable trucking time by delays in opening doors manually. Get more hours per day out of the trucks you have—with G-E photoelectric control. Bulletin GEA-1755C.

THINKING ABOUT THE FUTURE?

When planning new machines, new processes, new factory buildings—LOOK TO ELECTRONICS. Electronic production aids, like these on this page, offer real opportunities for improvements and economies. Come to General Electric for the electronic answer to your problems. General Electric, Electronic Control Section, Schenectady, N. Y.

Speed Production Electronically

GENERAL ELECTRIC

General Electric, Sec. E676-100
Schenectady, N. Y.

I want to know more about speeding production electronically. Please send me the bulletins checked:

- ☐ GEA-1755C—Photoelectric relays
- ☐ GEA-3680—Spectrophotometer
- ☐ GEA-3673, GEA-2543 } G-E electric gages
- ☐ GEA-3058B—Electronic contactors for a-c resistance welders
- ☐ GEA-2679B—Automatic light control
- ☐ GEA-2902B—Electronic timers
- ☐ GED-972A—Electronic motor control—Thy-mo-trol
- ☐ GEA-3530—Electron-tube control for steel mill application

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Parsons
VAL BAG
DUST
ARRESTORS

FOR LACK OF
DUST CONTROL
Production
WAS LOST!

• The most effective and destructive production blockade found in any plant is dust and dirt. Lack of dust control means deterioration of plant machinery, equipment and a tremendous loss in production. Dust has been the cause of millions of dollars worth of time lost by employees due to illness.

Lack of dust control costs many, many times more than the harnessing and actual control of it. In practically every installation of Parsons Oval Bag Dust Arrestors this fact has been proven in a very short time. Parsons Oval Bag Dust Arrestors are the result of engineering perfection gained over a long period of years in designing and building some of the outstanding dust arrestors in the world's leading industrial plants. Our engineers with over a quarter of a century's experience will be more than glad to discuss your particular dust problems and work out the solution. Dust control means peak production, more productive working hours per employee and machine plus protection for plant, equipment and labor.

Write for free catalog "Mastery of The Air."

PARSONS
ENGINEERING CORPORATION
CLEVELAND, OHIO

"Blackie" is a war worker, too. He even carries a badge, as he helps his blind master, Sylvester Rykowski, get to work at the Ford River Rouge plant

is hired by the company, a canvass is made to learn whether other employees live in his neighborhood. If they do, they are asked to assist in providing transportation to and from the plant.

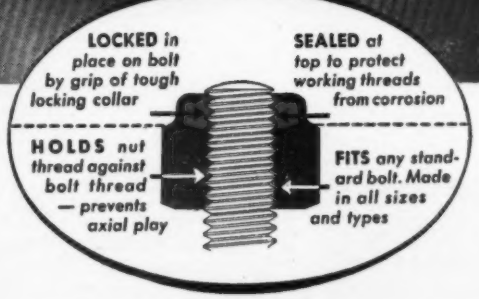
If there are no such employees who are neighbors, at least one in that vicinity is engaged and asked to use his car. Enthusiastic cooperation always has been received.

Today there are more than 100 deaf mutes in the River Rouge plant. They are employed in departments where danger is slight, since they are incapable of hearing warnings, bells, shouts, or signals. Prior to the war effort there were 71. It is notable, the company points out, that there never has been any difficulty with a deaf worker, and none ever has been involved in an accident.

The engagement of handicapped people was not an outgrowth of the wartime demand for manpower. Some 20 years ago, Henry Ford instructed plant managers everywhere that they were to make surveys of their communities and determine how many persons, in proportion to population, suffered from physical shortcomings.

When this survey was completed, word then went out that Ford plants in each community were to represent

TOUGH NUTS TO CRACK


LOCKED in place on bolt by grip of tough locking collar
SEALED at top to protect working threads from corrosion
HOLDS nut thread against bolt thread — prevents axial play
FITS any standard bolt. Made in all sizes and types

● We've made billions of Elastic Stop Nuts.

And to our knowledge not one has failed to do its job.

But the tough nuts we refer to now are the fastening problems which looked hopeless until Elastic Stop Nuts were used.

We've met lots of these in our day — and licked them.

There have been plenty of them in war production.

And how well these fastenings have filled the bill can best be told this way:

Every nut we can possibly produce is going into war goods. Yet even doubling our round-the-clock plant capacity hasn't let us gain on the demand.

In the days to come there will be many peacetime needs for these nuts.

Some will be simple. Others will look like "tough nuts to crack."

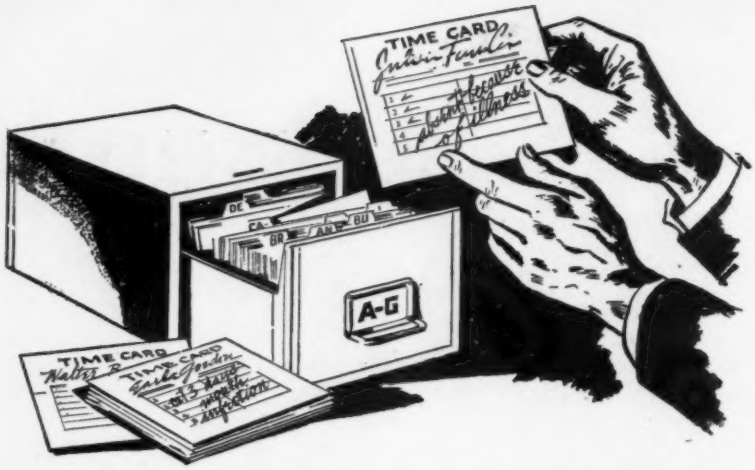
Our engineers like to meet both kinds. They stand ready to share their experience with you, work on your fastening problem and recommend the proper Elastic Stop Nut application for the job.

ELASTIC STOP NUTS

Lock fast to make things last

ESNA TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA
UNION, NEW JERSEY



What Price SICK ABSENTEEISM?

How many men and women fail to check in their time each day? You know...you see it in the payroll sheets...in the idle machines...in the slow-up of production.

Colds, a flu epidemic, trench mouth . . . where do they come from? How are they spread? More important still, how can they be prevented?

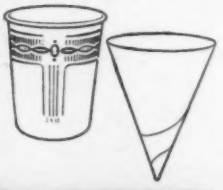
Eliminate the Contamination Point!

Public Health authorities agree that one of the dangerous avenues of contagion is mouth contact with anything that has touched the lips of others. It can happen at the water fountain . . . most surely happens where a cup or glass is used in common by several workers—witness the outlawed bucket and tin dipper of old.

The new way, the safe way is to provide fresh clean *Dixie Cups* for every drink. Women, especially, appreciate the health protection of individual paper cups; over other arrangements provided for drinking water.

Pays out in Better Employee Relations and Health

Plug the hole in defense against contagion! Get the facts and install *Dixie Cups.* Now, more than ever, it is patriotic to keep men well . . . and on the job!



Dixie Cups and Containers are made at Easton, Pa., Chicago, Ill., Darlington, S.C., Toronto, Canada

DIXIE CUPS

ONE OF THE VITAL HEALTH DEFENSES OF AMERICA-AT-WAR

a cross-section. If one out of every 6000 persons was blind, then one out of every 6000 Ford workers must be a blind man. If one in 1000 was deaf, then one out of every 1000 Ford workers should be deaf. The instructions have been observed carefully.

At the main River Rouge plant there is a special entrance for handicapped persons where they cross a

George Clinch lost his right foot 19 years ago. Today, with the aid of an artificial foot, he is doing his bit at Caterpillar, operating a mechanical burring tool

street at grade level and are protected by traffic officers, warning signs, and signals. They are guided to the cars in which they travel. The blind men, in some instances, have trained dogs to lead them.

Entire policy is predicated on the belief that no man is really handicapped as long as he has the courage to go ahead and the willingness to do his best. These people have come to the Ford plants and they have been made welcome. Today they are self-sustaining, self-respecting members of the community, capable of caring for themselves, with hope for the future.

Caterpillar Tractor

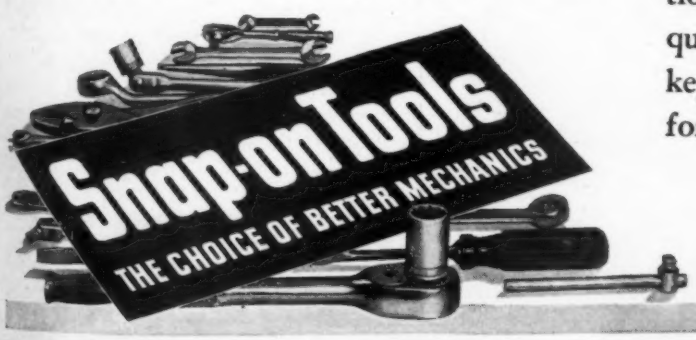
Physically handicapped men are as eager as the next fellow to devote their energies toward winning the war, and Caterpillar Tractor Company, Peoria, Ill., is giving them an opportunity to do so. To replace men who have joined the armed forces, Caterpillar has adopted the policy of employing men who have become handicapped

Tools that meet the need for *SPEED!*

Wherever hand tools are used on critical production, "tool speed" is a factor definitely to be concerned about. Inefficient hand tools . . . or tools poorly adapted to specific jobs . . . can hold down the performance of the best mechanic who ever swung a wrench.

Snap-on tools help meet today's need for speed . . . and *more speed.* They help turn out more work . . . and *better work.* Their flexibility and swift application, solid grip and powerful leverage, save precious minutes in every phase of production, assembly and maintenance.

3,000 Snap-on tools provide a wide selection of tool equipment for industrial requirements. 35 factory branches located in key cities assure prompt service. Write for catalog and address of nearest branch.



SNAP-ON TOOLS CORPORATION
8044-C 28th Avenue Kenosha, Wisconsin

LIMA GEARSHIFT DRIVES
Engineered for Performance
They are engineered for fast, precision production and to increase operator efficiency and accuracy. That is why LIMA Gearshift Drives are playing such an important part in machine tool and production equipment operations today.
Let us tell you how LIMA Gearshift Drives will increase your production. Wire or write us for address of Lima Engineering Service nearest you.
★ Buy War Bonds for Quick Victory ★
Large enough to successfully serve you, yet small enough to give personal attention to your needs.
DRIP-PROOF 1 to 75 HP
THE LIMA ELECTRIC MOTOR CO.
653 FINDLAY ROAD
LIMA, O. U. S. A.
EXPLOSION-PROOF 1 to 5 HP
POLISHING LATHES
OPEN
VERTICAL
TOTALLY-ENCLOSED
ELECTRIC LIMA MOTORS
• Standard Drip or Splash-Proof Motors
• Standard Open Motors
• Totally Enclosed Motors
• Explosion-Proof Motors
• Flanged Type Motors
• Gearhead Motors
• Special Types Built to Specifications
• Built-In Motors
• LIMA Gearshift Drives
• LIMA Magnetic Polishing Lathes
• LIMA Electric Pedestal Grinders

through accident or illness. Included are men who have suffered the loss of an arm, leg, hand, foot, or eye. When placed on jobs they are physically able to perform, their supervisors report that they are well able to do the work required of them.

Keeping Track of Labor Costs

(*Continued from page 116*)

employees are equivalent to the following hourly rates:

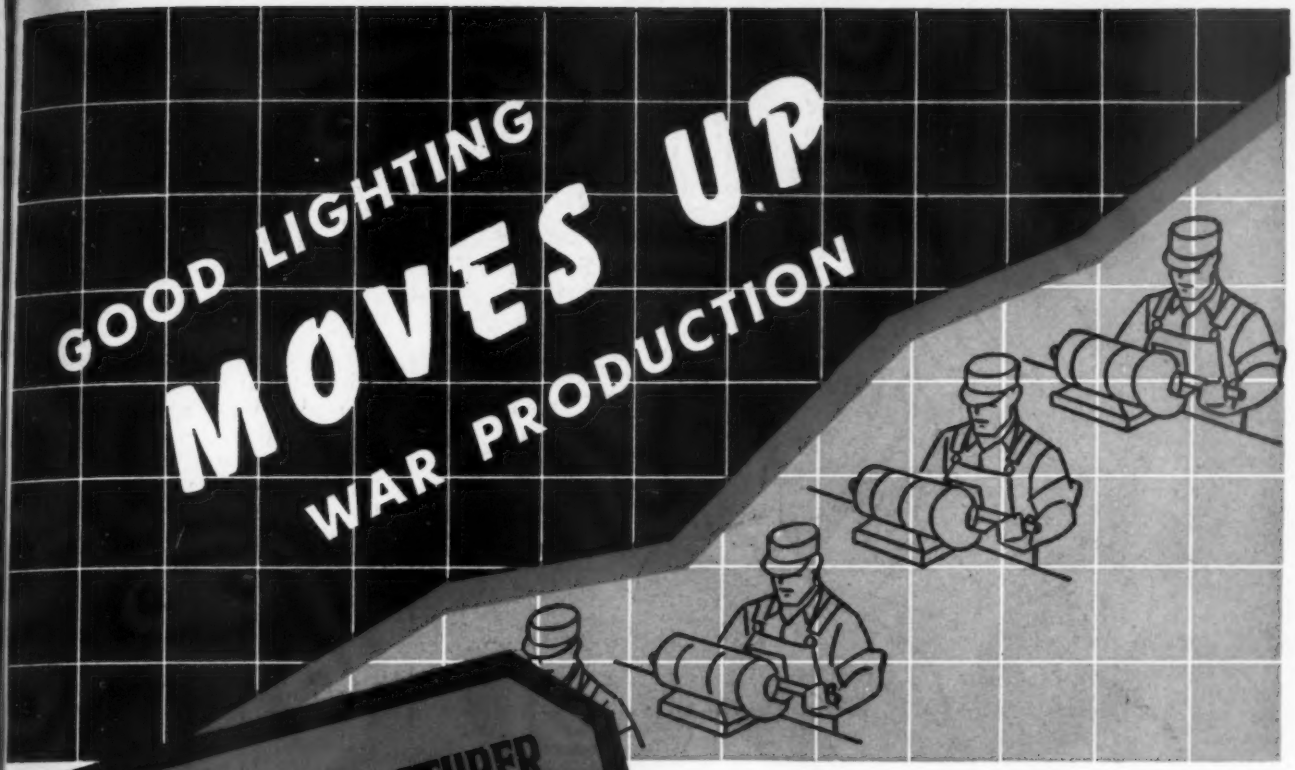
12 men at 60¢ per hour
12 girls at 40¢ per hour
12 men at 66¢ per hour (10 percent additional for night shift)

Then total payroll would amount to:
$[(12\times0.60) + (12\times0.40) + (12\times 0.66)] \times 40 = \$796.80$
If this is divided by 1440, we obtain a figure of \$0.5533, the average wage rate for the entire department.

We now know that during a week of operation the total production value amounted to \$10,410, and that the average wage rate was \$0.5533. It is possible, therefore, to set up a table of the values that will show the unit cost per dollar (see table on page 116).

Although all the columns are important to the cost analyst, it is the unit cost per dollar of direct labor expenditure that is of chief interest to management. Therefore, the figures appearing in the last column should be plotted on a 12-month chart, so that the progress of unit costs can be followed at a glance and comparative costs observed from one year to another. It will be noted that raw-material costs have not entered into the calculations, but these costs do not vary from week to week as much as direct-labor charges. Likewise, weekly sales are not taken into account, but these figures have no bearing on production efficiency and hence do not affect the results.

Since inaugurating this system we have found that it serves to disclose at a glance any undue rise in manufacturing costs. Plotting the unit cost per dollar has proved valuable, too, because it graphically compares our present costs with those of preceding weeks, as well as showing the differences from year to year. In times like these, with changes occurring at an ever-accelerating pace, the need for keeping constant watch on actual manufacturing costs has become of primary importance. We have found that application of the method as outlined has helped attain that end.



NAME OF MANUFACTURER

RLM

COMPLIANCE WITH SPECIFICATIONS UNDER INSPECTION APPROVED STANDARDS PROCEDURE OF RLM INSTITUTE CERTIFIED BY ELECTRICAL TESTING LABORATORIES

Manufacturers of RLM Certified Industrial Lighting Units

ABOLITE REFLECTOR COMPANY
West Lafayette, Ohio

BENJAMIN ELECTRIC MFG. CO.
Des Plaines, Ill.

BRIGHT LIGHT REFLECTOR CO.
Brooklyn, N. Y.

DAY-BRITE LIGHTING, INC.
St. Louis, Mo.

GOODRICH ELECTRIC COMPANY
Chicago, Ill.

THE MILLER COMPANY
Meriden, Connecticut

OVERBAGH AND AYRES MFG. CO.
Chicago, Ill.

QUADRANGLE MFG. COMPANY
Chicago, Ill.

SMOOT HOLMAN COMPANY
Inglewood, California

WESTINGHOUSE ELECTRIC AND MFG. CO.
Cleveland, Ohio

WHEELER REFLECTOR CO.
Boston, Massachusetts

*"PLANT EFFICIENCY," issued by the War Production Board's Division of Information urges good plant lighting as a practical means for securing: (1) Increased Production; (2) Better Workmanship; (3) Continued Production by Older Employees; (4) Less Eyestrain; (5) Reduction of Accidents; (6) Better Morale; (7) Better Housekeeping.

● Because good light helps good eyes do more . . . is even more helpful to older workers . . . efficient lighting has become a vital wartime production tool.

To be sure you give your employees all the *seven** advantages of good lighting enumerated by the War Production Board for workers in War Plants, specify RLM Certified Lighting Units . . . identified by the RLM LABEL.

RLM Certified Lighting Units are built to rigid specifications developed by RLM Standards Institute. Rigid and continuous inspection of Electrical Testing Laboratories assures conformity to RLM Specifications by all manufacturers authorized to supply RLM LABELED Industrial Lighting Units.

For full particulars write any manufacturer of RLM Industrial Lighting Units, or RLM Standards Institute.

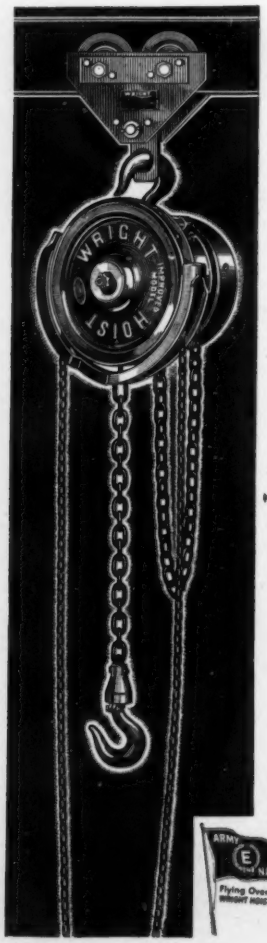
Guarantee

This RLM certified lighting unit, when properly installed and under normal conditions of use, is guaranteed against mechanical and electrical defects for a period of 90 days from date of delivery to the purchaser. Correction of such defects by repair or replacement of material only shall constitute fulfillment of all obligations under this guarantee by the undersigned manufacturer or distributor.

The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE
INCORPORATED

307 NORTH MICHIGAN AVE., SUITE 1600 • CHICAGO, ILL.



OIL REGULARLY!

In these days of shortages we don't need to know how to choose a new hoist—but how to use an old one more efficiently, and how to make it last longer.

So—get busy with the grease gun! Where properly lubricated and maintained, many **WRIGHT HOISTS** have given constant, trouble-free service for 20 and 25 years. We have known other hoists to be so badly abused they were ruined in two years. Your **WRIGHT HOIST** will last indefinitely if you treat it right.

If your hoist is under constant use, as on assembly line work, inspect and lubricate it at regular intervals. If it is subjected to intermittent service, then perhaps lubrication every three months and inspection every six months is sufficient. But keep your load chain well-lubricated at all times. A well lubricated chain will far outlast a dry chain.

Conserve steel, protect machinery and maintain production schedules by regular inspection and lubrication.

In Business for Your Safety

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, San Francisco, New York

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT, CONNECTICUT

Significant Labor Developments

(*Continued from page 119*)

parts for sale to other manufacturers within the state, who install them as replacements in machinery used in manufacturing goods for interstate commerce.

Employees who install new or repair parts in such machinery. (The ruling becomes important in view of the fact that servicing machines is a vital part of machine manufacturers' stock in trade and even though the servicing be within the state.)

Employees who repair or reconstruct machine parts for installation within the state in such machinery. (Recent rulings by Wage Hour Administrator.)

Employees who repair and maintain a road and bridge, collect tolls for the use of the road, and operate a drawbridge which was part of an interstate highway. (Overstreet vs. North Shore Corporation.)

Warehouse employees who order and procure goods from other states, receive and unload interstate goods at the warehouse and check them before they are unloaded and deposited on unloading platforms. (Goldblatt Bros. of Chicago.) (Review denied.)

Employees of wholesale firms who come under the Supreme Court decision in Jacksonville Paper Company case—i.e., engaged in operations from the delivery of interstate goods by the wholesaler to his retail customer when the goods were imported from other states in response to special order or pre-existing contract or understanding with the customer.

Employee of auction looseleaf tobacco warehouse, handling tobacco some of which comes from outside the state. (Walling vs. Lincoln Looseleaf Warehouse Company.)

Held Not Under the Act

Publicity department employees, even though advertising copy and circulars on which they work are distributed in other states (Goldblatt Bros.)

Truck drivers handling baggage from a railway depot, since not engaged in interstate commerce. (Ridley vs. General Cab Company.)

Employees engaged solely in moving the goods from the platforms into the warehouse or in their subsequent distribution to the company's retail stores located in the same state. (Goldblatt Bros.)

Watchmen employed by seafood

G-E LOOM BUS-DROP CABLE

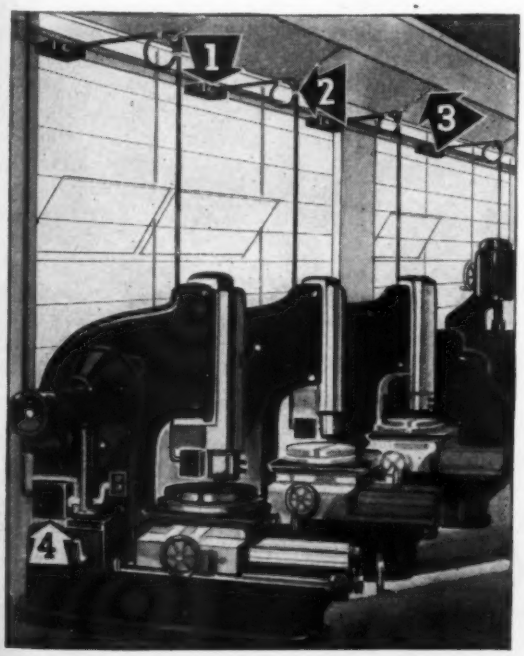
For Power Distribution from Bus Bars to Machines

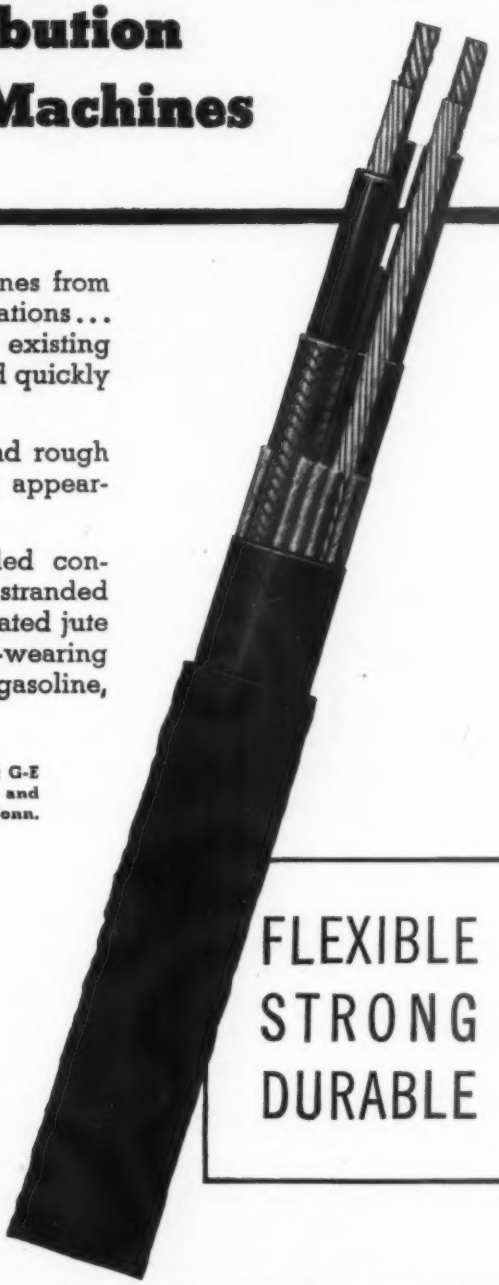
Here is the ideal cable to bring power to machines from bus systems. Use G-E Bus-Drop Cable for new installations . . . for conversion installations . . . for maintenance of existing bus systems. This cable can be hooked up easily and quickly from LVD or bus-duct systems to machines.

G-E Bus-Drop Cable is designed for long life and rough usage. It will stand up under vibration. It is neat in appearance and looks well in open wiring.

This high quality cable consists of three stranded conductors rubber-insulated and braided and a bare, stranded ground wire. The conductors are cabled with saturated jute fillers and presaturated paper tape. Over-all is a long-wearing rugged LOOM weave that resists oil, grease, gasoline, moisture and flame.

For further information about G-E Bus-Drop Cable see the nearest G-E Merchandise Distributor or write to Section W333-37, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.



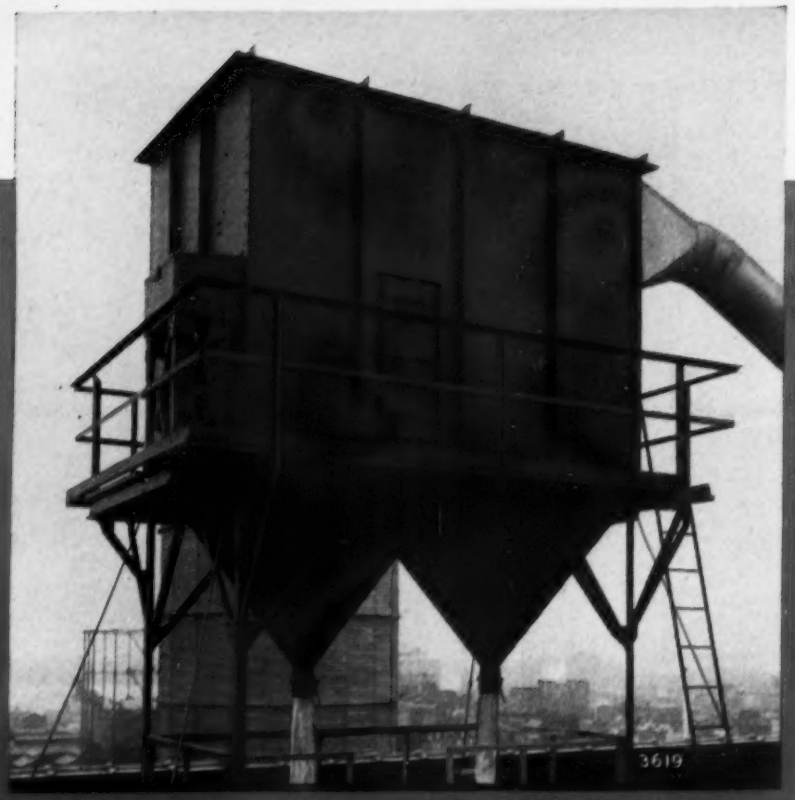


FLEXIBLE
STRONG
DURABLE

TYPICAL G-E BUS-DROP CABLE INSTALLATION

G-E Bus-Drop Cable can be run horizontally from service box (1) attached to bus, to a point (2) over machine. At (2) it is looped and supported from point (3) by a spool-type porcelain insulator attached to a tension spring. It then drops vertically to control (4) on machine.

GENERAL ELECTRIC



SAVE MANPOWER
WITH SLY DUST CONTROL

Sly Dust Filter in a factory operation exhausting 10,000 cu. ft. of air per minute.

Valuable man-hours are being saved, production increased, quality of products improved, machinery and equipment life lengthened through Sly Dust Control.

Sly Dust Filters (the heart of the system) embody these important and *exclusive* features:

1. Greater filtering capacity because of more filtering cloth
2. Taut bags (patented) save power and improve dust removal
3. Bags more easily replaced
4. Automatic control (any degree) minimizes or entirely removes the human factor
5. Simpler shaker mechanism results in savings in maintenance and operation

Yet, with all its advantages, Sly Dust Control is not expensive. Tell us your problem so that we may write you fully. Ask for Bulletin 98.

THE W. W. SLY MFG. CO.
4755 Train Ave. **Cleveland, Ohio**

SLY
INDUSTRIAL DUST CONTROL

processing and canning company, during the dead season as well as the active. (Waller vs. Humphreys Canning Company.)

WAR LABOR BOARD

Twelve Regional Boards Set Up by WLB

To expedite the consideration of labor disputes, WLB has set up twelve regional boards. Each regional board will have public, employer, and labor representatives. Under this procedure, all new cases will automatically go to the regional boards, except cases in certain specialized fields which have established commissions (nonferrous metals industry, trucking, shipbuilding, and building trades).

The procedure requires (1) mediation efforts by the U. S. Conciliation Service; (2) a hearing before a regional board panel with recommendations to the regional board; (3) a decision by the regional board.

* *WLB Defers to NLRB*

WLB, respecting the jurisdiction of NLRB, refused to direct an employer to deal with a specific union which had altered its affiliation. The question of determining who is the appropriate bargaining agency, and whether management must deal with it, belongs to the NLRB, and for any relief that Board must be petitioned. (Easy Washing Machine Company.)

WLB refused to interfere with the collective bargaining process by ordering the exclusive recognition of a union representing a majority of employees. WLB, however, did order an interim settlement which called for recognition of the union for its members in handling grievances and urged the NLRB to expedite the election. (Tennessee Schuylkill Corp.)

* *Delegation of Wage Authority*

The National Housing Agency is authorized to make pay adjustments for employees whose wages are not fixed by statute. (War Labor Board General Order 27.)

* *Increase Ordered Despite Employer's Inability to Pay*

Even though the employer was unable to pay an increase, WLB ordered such payments made. However, in view of the circumstances, and the further fact that the employer was subject to OPA ceilings, the Board was led to deal more leniently with the employer, by requiring payment of only half the amount to which the

* In this and the following classification items marked with an asterisk also are considered to be trend indicators.

STERLING 1000

New Electric Portable Sander

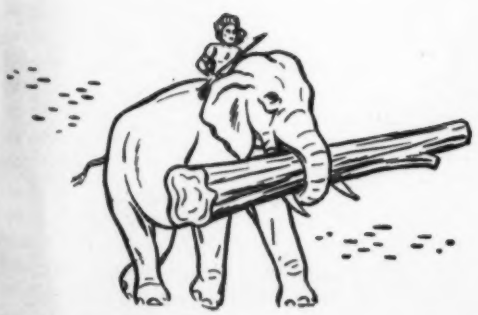
POWERFUL YET VIBRATIONLESS!

The NEW "Sterling-1000" Electric Sander packs the kind of power punch you want! All the strength you need for continuous high speed production, yet *controlled* to obtain absolute *vibrationless* operation. The "Sterling-1000" is stout enough to tackle the toughest job—streamlined and balanced for easier handling. An engineering triumph! Won't shake itself into breakdowns—or jingle-jangle the operator's nerves! Women operators prefer operating this new sander!

NEW SANDING ACTION CUTS FASTER—SMOOTHER!

Orbital, circular, thousands of abrasive grains cut furrows which cross and recross each other. With this action, the "Sterling-1000" *cuts faster*—produces the smoothest surface you've ever known on wood, metal, plastic or composition. Ideal for many rubbing and polishing operations.

Write today for your copy of the New "Sterling-1000" folder which describes its every detail.



STERLING TOOL PRODUCTS COMPANY
390 E. OHIO STREET • CHICAGO, ILL.

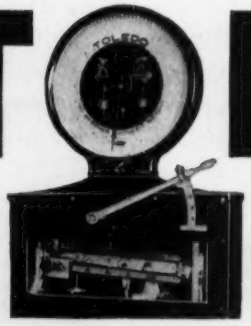
615 W. WASHINGTON BLVD.
LOS ANGELES, CALIF.

74 WELLINGTON STREET, W.
TORONTO, CANADA

Tremendously expanded production of synthetic rubber at the plant shown finds Toledo Hopper Scales on the job... to *carefully* and *accurately* weigh out ingredients.

And that's just *one* of countless examples showing how Toledos meet industry's wartime needs... solving today's new problems in weighing, balancing, force-measuring and counting. Whatever *your* weighing problems... for today or the future... get Toledo-engineered and Toledo-built *accuracy, speed* and *dependability.* Write for latest information. Sales and Service in 181 cities. Toledo Scale Company, Toledo, Ohio.

TOLEDO



HEADQUARTERS FOR ALL TYPES OF SCALES

employees would be entitled under the Board's standard cost-of-living formula. As to the balance, determination was postponed pending an adjustment to be made by OPA. However, where an employer who was unable to pay the increase was not subject to OPA ceilings, as in the case of a hospital, the Board nevertheless ordered it, informing the employer that it could increase its rates to absorb the additional amount. (Quaker City Cold Storage Co.; San Francisco Hospital Conference.)

Increase Allowed

On the other hand, a wage increase was granted employees who were receiving substantially lower wages than those paid by other industries in the area. The employer in that case operated a transportation system in a boom town serving the shipbuilding industry. Between the high paying shipbuilding company and the transportation company there was a differential of 50 cents, making it difficult to attract bus operators. The increase granted restored the peacetime relationship between the two top rates. (Virginia Public Service Co.)

Further Evidence of Failure of 15 Percent Formula

An escalator clause in a collective bargaining contract authorizes general wage increases up to the limit of the cost-of-living formula, even where average straight time hourly earnings have increased more than 15 percent. (Malleable & Steel Castings Company.)

Increase Granted Above 15 Percent

To meet a special situation, WLB ignored an increase granted some 26 days after the standard base date. In applying its 15 percent formula, it did so as of Feb. 1 instead of Jan. 1.

Where a company discarded a profit-sharing plan for its employees, WLB ruling that it must pay wages equal to the highest amount received by the employees between January 1 and September 15, 1942, effected an adjustment of the base rate by 15 percent. (Hood Rubber Company.)

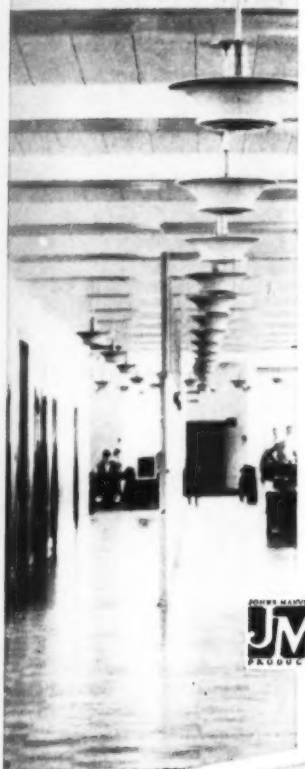
** Increase Disallowed*

WLB denied a voluntary increase in excess of the 15 percent (cost-of-living) formula, because it was not satisfied that there were sufficiently compelling reasons to justify the increase (i.e., substandard wages, inequalities, or gross inequities). (Kerckhoff Company.)

WLB will not upset a contract unless it must. Employees of a company that had not consistently followed the wage adjustment pattern of the

WARTIME EFFICIENCY

can be increased, foot fatigue reduced with this resilient floor covering



Colorful Johns-Manville Asphalt Tile Floors also provide a cheerful, morale-building place in which to work

FOOT FATIGUE *cannot* be overlooked today—because of its tendency to slow down work. That's why more and more companies engaged in war work are installing resilient J-M Asphalt Tile Flooring . . . in offices, cafeterias, employee recreation rooms, and even out in the plant where workers, especially women, must stand on their feet all day.

J-M Asphalt Tile floors are durable, easy to clean, require little if any maintenance, and contain no critical materials. They cost less than any other type of quality resilient floor covering on the market!

For Full-Color Brochure of Facts and Design Suggestions, write Johns-Manville, 22 E. 40th St., New York.

JOHNS-MANVILLE *Asphalt Tile* FLOORING

J-M Asphalt Tile Floors—J-M Acoustical Materials and J-M Movable Transite Partitions are helping to speed up war production in offices and plants everywhere.

She's not punch press operator #1146 Now

When the bell rings and the day shift goes off, you would never recognize punch press operator No. 1146. She's Miss America now—as careful of her appearance as the stenographers in the general office. And her importance to manufacturers today poses a problem that those manufacturers must solve. A clean, attractive place to wash up after a day's work—ample quantities of hot water—clean towels—a large mirror—these are all important to the girls who man our machines.

Plant washrooms properly equipped—conveniently located—can do much in preventing wasted time—in promoting workers' health and workers' loyalty.

The complete Crane line of plant washroom equipment includes fixtures specially designed to meet all industrial needs. And it uses only a minimum of critical materials. Your Crane Plumbing Contractor or nearest Crane Branch will be glad to assist you in equipping your plant washrooms with greater efficiency and economy—call them.

CRANE

CRANE CO., GENERAL OFFICES:
836 S. MICHIGAN AVE., CHICAGO

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES, WHOLESALERS, PLUMBING AND HEATING CONTRACTORS

steel industry were held not entitled to an increase retroactive to the date of the Big Steel or Little Steel wage increases because their employer operated in the general steel area. WLB will respect the contract between a company and a union and will apply the contract provisions as to the date of increase. The benefit of the retroactive pay will be applied by the Board "only in those cases in which the operative facts are substantially on all fours with the facts of the Big Steel case." (Oliver Iron and Steel Corporation.)

** Little Steel Formula Continued*

WLB refused to deviate from the Little Steel formula when it denied an increase to the meat-packers' union. The increase was urged on the ground that common labor wage rates in the meat-packing industry followed wage increases for common labor in steel for a period of seven years. The Board, however, refused to recognize such an absolute interdependence of general wage rate movements between these two industries, which, it held, are subject to fundamentally different economic forces. (Meat Packers case.)

** Premium Pay Denied*

An increase by way of premium payment for night shift was denied the union on the ground that the latter had not introduced sufficient evidence to justify Board's ordering the company to grant such an increase. The company's practice in making such payments was not a common one in the area where the plant was located. (Oliver Iron and Steel Corporation.)

Check-Off Rules Issued by WLB

1. If an employee receives no pay on the first payday of the month, the company is obligated to make the deduction at any time during the month in which the employee does receive pay for union dues owing for the preceding month.
2. In the event an employee does not receive any pay during a particular month, the employer is obligated to make the deduction the following month for the union dues owing for the two preceding months.
3. If, under union regulation or under constitutional provisions, an employee is exonerated from paying his dues when he has not been employed for a certain period of time, to that effect so that no union dues need to be deducted for the particular employee for the applicable month.

Reason for *Granting Maintenance of Membership*

Geographical separation of a com-

TOP EFFICIENCY with RLM Non-Metallic Reflectors!

Typical Wheeler convenience! Quick, easy access to operating parts by loosening two thumb-screws. Exclusive chain hangers support detached reflector. No loose screws, bolts or nuts to handle.

New "War-Aid" Fixtures insure availability of Wheeler SKILLED LIGHTING for war plants!

In spite of wartime metal scarcity, you can obtain fluorescent lighting fixtures with all the lighting efficiency and convenience of pre-war Wheeler "Skilled Lighting" units. Wheeler's 60 years' experience in better lighting has now produced top-standard "War-Aid" models requiring minimum metal!

Reflectors of "War-Aid" units are rugged non-metallic material. Non-flammable, moisture-resistant. Reflecting surfaces of chip-proof, washable baked enamel provide minimum efficiency of 80% in 48" 2-lamp units; 73% in 3-lamp units; and 73% in 60" 2-lamp units. Available for individual or continuous-run installations.

Write for full details of Wheeler "War-Aid" Fixtures and catalog of Incandescent Fixtures. **Wheeler Reflector Company, 275 Congress Street, Boston, Massachusetts.** New York . . Cleveland. Representatives in principal cities.

Distributed Exclusively Through Electrical Wholesalers

Wheeler REFLECTOR COMPANY

Lighting Equipment Specialists Since 1881

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Dual Operation of Two Speed Pumps

contribute to fast and easy operation

Model 30.11A
. . . 30 ton
capacity

Speed up war production jobs involving lifting, pressing, bending, etc. - - with

HEIN-WERNER HYDRAULIC JACKS

If your factory is doing war work—you can lick many production problems by utilizing Hein-Werner Hydraulic Jacks. They are great for moving or lifting machinery, heavy materials, etc., and can also be used for pressing and bending operations.

Model 30.11A (illustrated) is unusually fast and easy operating. In the initial operation, the jack handle is extended through the handle sockets of both the *high speed pump* and the *high pressure pump*, thus giving the combined displacement of both pumps to attain *maximum speed*. If and when the pumping becomes an effort for the operator, he simply pulls the handle back out of the handle socket of the high speed pump, (thus disengaging the high speed pump)—and he finishes lifting the load by utilizing only the high pressure pump which operates at slower speed and minimum effort.

For full details on Model 30.11A, as well as on 3, 5, 8, 12 and 20 ton models, consult your industrial supply distributor, or write us.

HEIN-WERNER MOTOR PARTS CORP.
Waukesha, Wisconsin

HEIN-WERNER HYDRAULIC JACKS
Are Built Right and Priced Right

pany's plant has been deemed sufficient ground for granting a maintenance-of-membership clause, since the union was losing members because of the difficulty of retaining contact with them. (Shell Oil Company.)

Maintenance of Membership Granted Despite Strike

WLB's leniency toward unions is evidenced by the grant of a maintenance-of-membership clause despite the fact that the union's record was compromised by the occurrence of two "small" strikes. The union was granted another opportunity to prove its responsibility. (Ohio Steel and Foundry Company.)

** Union Security Provisions Withheld*

WLB allowed an increase to all employees in union and non-union plants alike, but, because the men engaged in seeking the increase engaged in a strike, the union security provisions are withheld until such time as the union demonstrates its sense of responsibility. (Pittsburgh Limestone Corporation.)

Union Security Granted Despite Strike and Slowdown

Heretofore WLB has distinguished between strike and demonstration. Now it differentiates between a strike-vote and a strike mounting to an actual stoppage. For taking a strike vote the union was not denied a maintenance-of-membership clause, more especially since the enterprise was located in an anti-union community (Dahlstrom Metallic Door Company). Nor did slowdown partly caused by lack of materials disqualify a union from receiving a maintenance-of-membership clause. (Jamestown Steel Partition.)

** Limited Recognition Ordered*

WLB directed that a union be recognized as the bargaining agency of its members for a limited time even though it has engaged in a short strike when balked in procuring bargaining status through the employer's litigation. (Acme Evans Milling Co.)

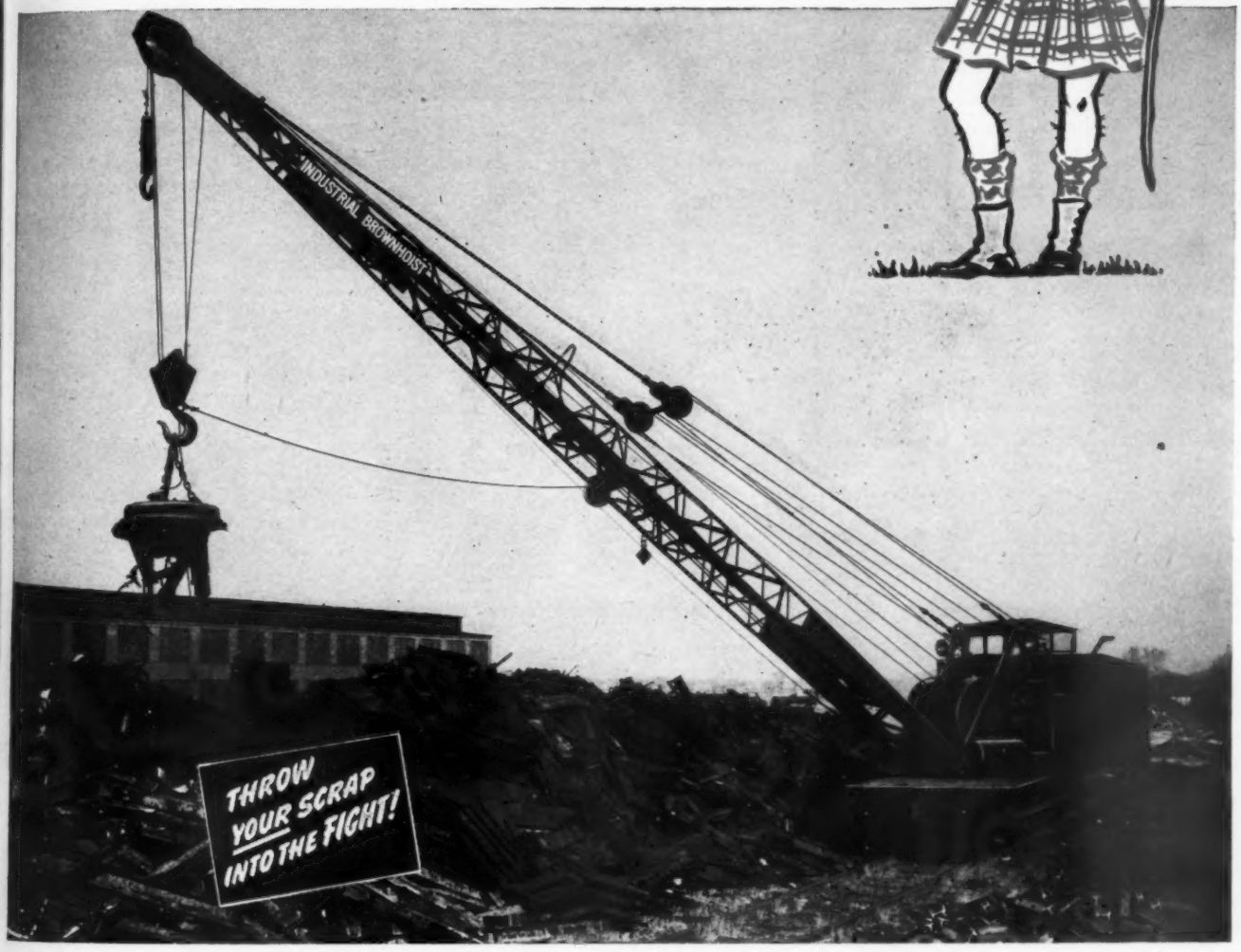
Shop Steward Not Responsible Union Officer for Escape Clause Purposes

An employee may avail himself of the escape period clause even though he serves notice orally, provided it is given to a responsible officer of the union. A shop steward is not such a responsible officer. The penalty for failing to give notice is compulsory discharge, if employee fails to pay his dues. (American Car & Foundry Co.)

Held Not Ground for Non-Compliance

An employer cannot refuse to comply with an arbitrator's award on the

You save fuel oil with an I.B. Crane



With the fuel oil shortage becoming more acute each day it is vital that every industrial plant squeeze the last drop of energy out of every drum. And that's just where Industrial Brownhoist Diesel Cranes are doing a fine job—by saving oil. One plant operating a 30 ton I. B. Crane reports an average fuel consumption of only 1.675 gallons per hour. Another reports only 1.61 gallons per hour. Both cranes were operating under fast, continuous, heavy duty service. These are not isolated cases. Those users who keep an eye on fuel consumption invariably find that I. B. Cranes are easy on fuel.

Whether you handle heavy materials with magnet, hook or bucket you, too, can save fuel with an Industrial Brownhoist Crane. Industrial Brownhoist Corporation, Bay City, Michigan. District offices: New York, Philadelphia, Pittsburgh, Cleveland, Chicago.

INDUSTRIAL BROWNHOIST BUILDS BETTER CRANES

IN post-war years the trouble of figuring your income tax may be eliminated (the headache will probably remain the same) with the clever application of electrical apparatus. Just whether this would be an unmixed blessing, we are not prepared to state.

That there will be innumerably more applications of electrical science in after-war years is too patent a fact to be questioned. Just what their manifold functions will be is a fertile field for prophecy.

But whatever their form or function, if they are operated by electrical circuits and made to the highest order, you'll more than likely find Cannon Connectors playing a vital part in their operation.

Type P Cannon Connectors are universally used in radio, sound apparatus and allied applications. Other types of Cannon Connectors are used in a wide variety of wartime and peacetime industries including television, shipping, lumber, aircraft, motion pictures and in geophysical research; in fact wherever dependable connections are needed.

CANNON ELECTRIC

CANNON ELECTRIC

Cannon Electric Development Co., Los Angeles, Calif.

Canadian Factory and Engineering Office: Cannon Electric Co., Ltd., Toronto

REPRESENTATIVES IN PRINCIPAL CITIES — CONSULT YOUR LOCAL TELEPHONE BOOK

ground that it will lower morale and production in the plant. (Alexander Milburn Company.)

* *Entire Renegotiation of Modified Contract Disallowed*

When employer and union have agreed on the provisions of a collective bargaining contract and the Board subsequently modifies the terms of that contract, the union could not reject the contract as modified and renegotiate the entire agreement. (S. K. Wellman Company.)

Reinstatement of Saboteur Denied

Where an employee had been discharged for alleged sabotage, WLB refused to order reinstatement. However, it did direct that the employee be granted a fair hearing. (Centrifugal Fusing Company.)

NATIONAL LABOR RELATIONS BOARD

* *Good Faith Required in Collective Bargaining*

An employer does not fulfill his duty to bargain collectively under the New York State Labor Relations Act when all he has done is to explain his status quo to the union and insist he will adhere to it. An employer's mere willingness to confer with the union is not sufficient. Collective bargaining, the court pointed out, contemplates that the parties will approach negotiations with an open mind and a sincere determination to arrive at an agreement. (New York State Labor Relations Board vs. Montgomery Ward.)

Non-Commercial Enterprise Under the Act

Non-profit institutions such as charitable hospitals were held subject to the Wisconsin Employment Peace Act since, as the Board indicated, there can be as much dissatisfaction in such institutions as in commercial enterprises. (Wisconsin Employment Relations Board vs. Evangelical Deaconess Society of Wisconsin.)

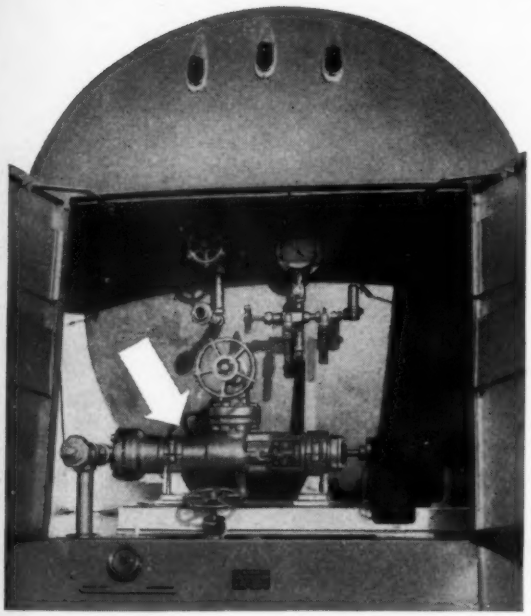
* *Management's Right to Control Schedules*

A contract which insures to management the right to alter working schedules, with a provision that it will consult the union and notify it of changes in advance of their adoption, does not mean that the union's consent is necessary to make such changes. However, the issue must be submitted to the grievance committee when the union's consent is not secured. (National Supply Company.)

* *Management's Right to Lay Off*

NLRB decided that employers have

What Pump Can Handle *This?*



The Cardox Corporation transports liquid carbon dioxide in large tank trucks. Each is equipped with an R & M Moyno Pump, which transfers the liquid into storage tanks of Cardox Industrial Fire Extinguishing Systems. The Moyno is here seen installed in the rear of a tank truck.

It's carbon dioxide, here being released by a Cardox Industrial Fire Extinguishing System to "knock out" a fire in a factory. In liquid form—the form in which it is transported and stored—carbon dioxide is very difficult to pump. Cardox engineers have found that the R & M Moyno Pump is ideal for handling it.

Pumping liquid carbon dioxide (in solid form, "dry ice") was a tough problem for Cardox engineers, before they tried the R & M Moyno Pump. Liquid CO_2 changes to vapor under some conditions—*stymies* conventional pumps. But not the Moyno! Self-priming and positive in displacement, without pistons or valves, a large number of Moynos are rolling up phenomenal performance records in Cardox delivery fleets all over the country.

In other industries vital to the war effort this pump is solving even *tougher* problems. It is high-pressuring gun-boring coolants; pumping abrasive slip for airplane spark plugs; handling propane gas, glucose, vitreous enamel, heavy acid sludge, and even molten rosin. And all with a *record minimum* of wear and maintenance.

If *you* have a pumping problem, investigate the R & M Moyno. Chances are the Moyno can solve it. Write for complete details today!

ONLY 1 MOVING PART!

Here's the patented principle of the R & M Moyno Pump's amazing performance. A single-threaded helical rotor revolves within a double-threaded helical stator, providing pumping action like that of a piston moving through a cylinder of infinite length.

ROBBINS & MYERS • Inc.

MOYNO PUMP DIVISION — SPRINGFIELD, OHIO

In Canada: Robbins & Myers Co. of Canada, Ltd., Brantford, Ont.

HOISTS • CRANES • MOTORS • MACHINE DRIVES • FANS • FOUNDED 1878

MAKING HEAVY BOMBERS LIGHT

Buell Dust Recovery Systems play an important part

The lighter the bomber itself, the bigger its bomb load. So America's air might is muscled with modern metals — aluminum, magnesium, beryllium, molybdenum and others—that are miracles of both strength and lightness. In the bombers above, for instance, motor weight per horse power is barely over a pound—down from 12.7 lbs. per h.p. at Kitty Hawk.

Buell Dust Recovery Systems play an important part in the process of transmuting ore into these vital metals. Installed in conjunction with pulverizers, kilns, roasters and sintering furnaces, Buell cyclones recover for re-use virtually 100% of the critical material that would otherwise escape in the flue gases —a saving that mounts up to thousands of tons annually.

The high efficiency of Buell Dust Recovery Systems is due to the van Tongeren cyclone—an ingenious design feature found only in Buell equipment. Long life, low operating cost, negligible maintenance and unlimited capacity are other important advantages that have made Buell Dust Recovery Systems first choice with so many great industrial concerns.

Memo to—

EXECUTIVES & ENGINEERS

Buell Dust Recovery Systems are widely used in

CHEMICAL & PROCESS INDUSTRIES
FOUNDRIES & MACHINING OPERATIONS
FOOD PROCESSING
ROCK PRODUCTS INDUSTRY
POWER PLANTS
MINING & METALLURGY

and other industries for the elimination of hazardous dust nuisances and the recovery of critical materials.

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DUST RECOVERY SYSTEMS

Factual 28 pg. book. Write for Bulletin G-842

BUY WAR BONDS AND MAKE THE AXIS BITE THE DUST

the right to lay off but not to discharge. An employer was held to be justified in laying off employees who persisted in their refusal to work overtime. However, discharge would not be justified since the refusal to work overtime resulted from a labor dispute, unless violence was involved. (Mt. Clemens Pottery Company.)

Apprentice Entitled to Collective Bargaining Benefits

An apprenticeship may not be barred from the benefits of collective bargaining. Such exclusion resulted where the employer required his apprentice to deposit his wages with the employer and to remain in his job for a year under penalty of forfeiting $500. (Spalek Engineering Co.)

* *Employee Entitled to Fair Hearing Before Union Expulsion*

While a discharged employee who has been expelled from a union has no recourse against his employer, who is bound by a closed shop, the employee may compel the union to grant him a fair hearing before depriving him of his membership. (Armant vs. Cannon Employees Ass'n.)

* *Successor Corporation Ordered to Reinstate*

NLRB ruled that employees who had been unlawfully discharged by a predecessor corporation were entitled to reinstatement by the successor corporation but without back pay, since the new corporation was under the same management and conformed to the same labor policy. It refused, however, to penalize the successor organization unnecessarily. (Weisberg Baer Company.)

No Appeal Where Reinstatement Denied

A discharged employee to whom the NLRB denied reinstatement cannot get relief by appeal to the U. S. Circuit Court. (Anthony vs. NLRB.)

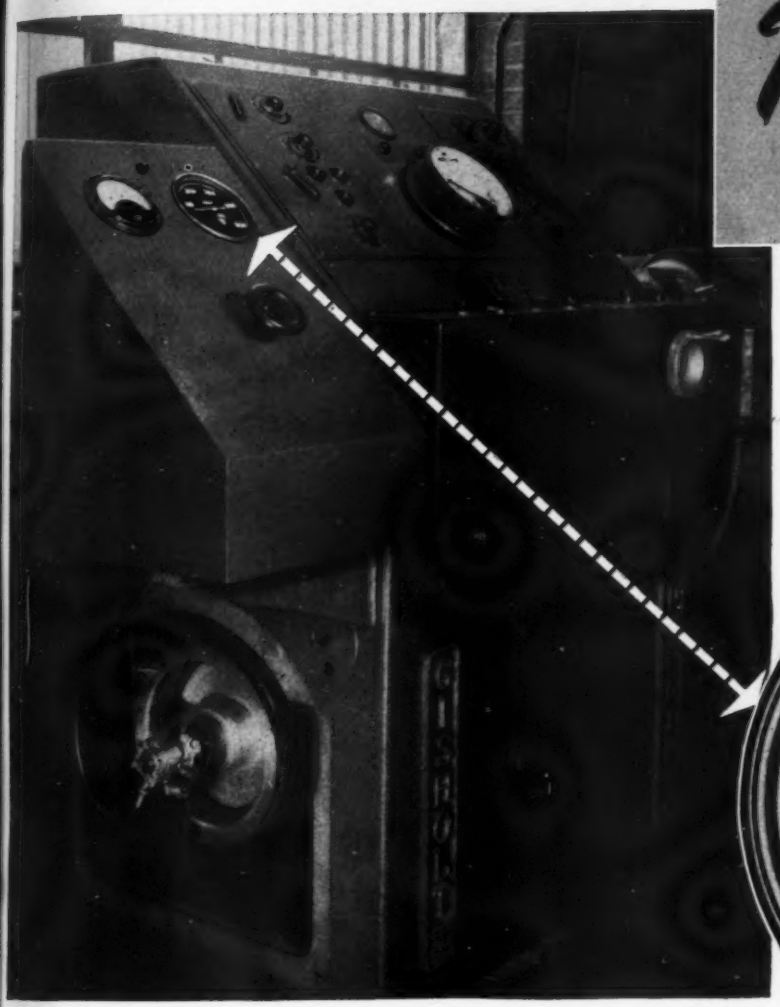
* *Employees May Not Re-Open Back-Pay Order*

When the court has reviewed a back-pay order of NLRB, and entered a decree enforcing such an order, employees may not thereafter intervene and claim that the Board was in error in accepting a lump sum from the employer in settlement of its liability, and that the employer owes a larger sum to his employees. (Stewart Die Casting Corporation.)

Held Employer Interference

An employer was guilty of interference when he procured the arrest of persons distributing union literature in his plant. The plea that the distrib-

There's One Easy Way to KNOW the "Unit Rate" each machine is producing!

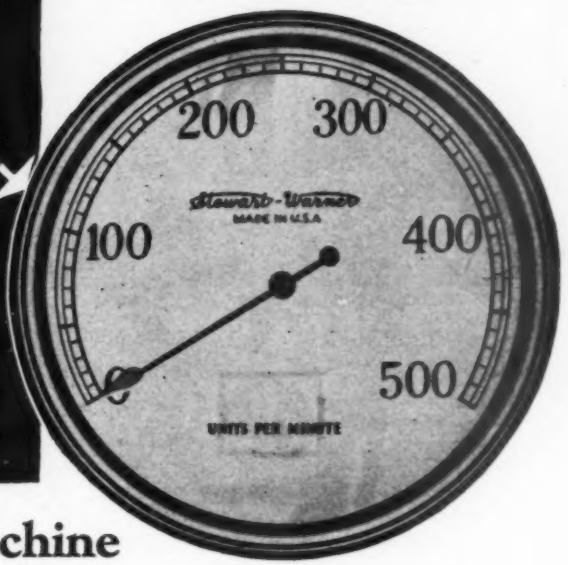


Production-Control

WITH

STEWART-WARNER

INDUSTRIAL TACHOMETERS



Measure Production on any Machine When Output is Proportionate to Rotation

SO MANY manufacturers are making Stewart-Warner Tachometers part of the standard equipment on their machines, that guesswork is no longer the general rule, as it used to be. But it's no trick to *add* this invaluable "production control" to *any* machine where output is in direct proportion to the rotation of a shaft!

It's the only way to keep a constant check on every machine! With a Stewart-Warner Tachometer on the job, you can know the exact production rate of every machine at any given time! Whether you're making yards of cloth or wrapping loaves of bread—whether it's a lathe or a printing press—"production control" is of vital importance if you're to maintain wartime schedules!

Take action now to give your foremen—your superintendent—your cost department—the vast advantages of "production control." Mail the coupon today.

STEWART-WARNER

INDUSTRIAL TACHOMETERS

Another Product of STEWART WARNER

1870 DIVERSEY PARKWAY
CHICAGO, ILLINOIS

STEWART-WARNER CORPORATION
1870 Diversey Parkway, Chicago, Illinois

Please send me complete information on PRODUCTION CONTROL with Stewart-Warner Industrial Tachometers.

*Name*_____

*Address*_____

*City*_____ *State*_____

*Firm Name*_____

RE-LIGHTING

the new manpower / production requirement

Vital to plants built and lighted for daylight operation

Most plants operating today were designed and built for peacetime, *daylight* working schedules. Wartime production demands night work. *Lighting based on daylight conditions is inadequate to serve the needs of night workers.*

Night production is generally acknowledged to be anywhere from 20% to 40% less efficient than daytime production. And poor lighting, with its consequent eyestrain, fatigue, and lower working efficiency, is a major cause of this slump.

Re-lighting for 24-hour-a-day war production is the easiest, most economical remedy for this condition. Re-lighting does not mean discarding your present lighting system. It merely means bringing the equipment you have up to date by relocating lamps to eliminate glare and shadow; increasing lamp wattages, re-spacing lamps, installing additional equipment to insure uniform lighting levels throughout your plant. A Silv-A-King lighting engineer can tell you exactly.

Silv-A-King's part in the war effort includes the production of parts for torpedoes, bombs, gliders and other aircraft; as well as naval and surgical equipment.

BRIGHT LIGHT REFLECTOR COMPANY, INC.
1027 Metropolitan Avenue, Brooklyn, N. Y.

Send for your copy of our 16-page book: "Light Is An Essential Production Tool"

SILV-A-KING MAKES *Light* WORK FOR YOU

utors may be spies or saboteurs was dismissed by the Board. The employer, it considered, was aware of the union's attempts to organize and could not prevent the employees from exercising their rights accorded by the Wagner Act under the guise of precaution. (Spalek Engineering Company.)

Reconsideration by NLRB Ordered

Although the Board is the sole judge of facts, the Supreme Court ordered a case remanded to NLRB to hear additional evidence on credibility of witnesses whom the employer charged with violence. (NLRB vs. Indiana & Michigan Electric Company.)

** Oral Agreement Ineffective*

Where a collective bargaining contract is oral it does not prevent the Labor Board from determining the representatives anew. Reducing the contract to a written agreement is not a mere formality. In fact, the U. S. Supreme Court has held that a refusal to sign an agreement reached through the process of collective bargaining constitutes a refusal to bargain collectively in violation of the Wagner Act. (Eicor.)

** Penalty on Employee for False Statement of Back Pay*

For understating the amount of money earned over a period during which he claimed back pay, the Board on its own initiative reduced the award to an employee by half, even though the court refused to disturb the order. (Wilson & Company.)

** Rights of Supervisors*

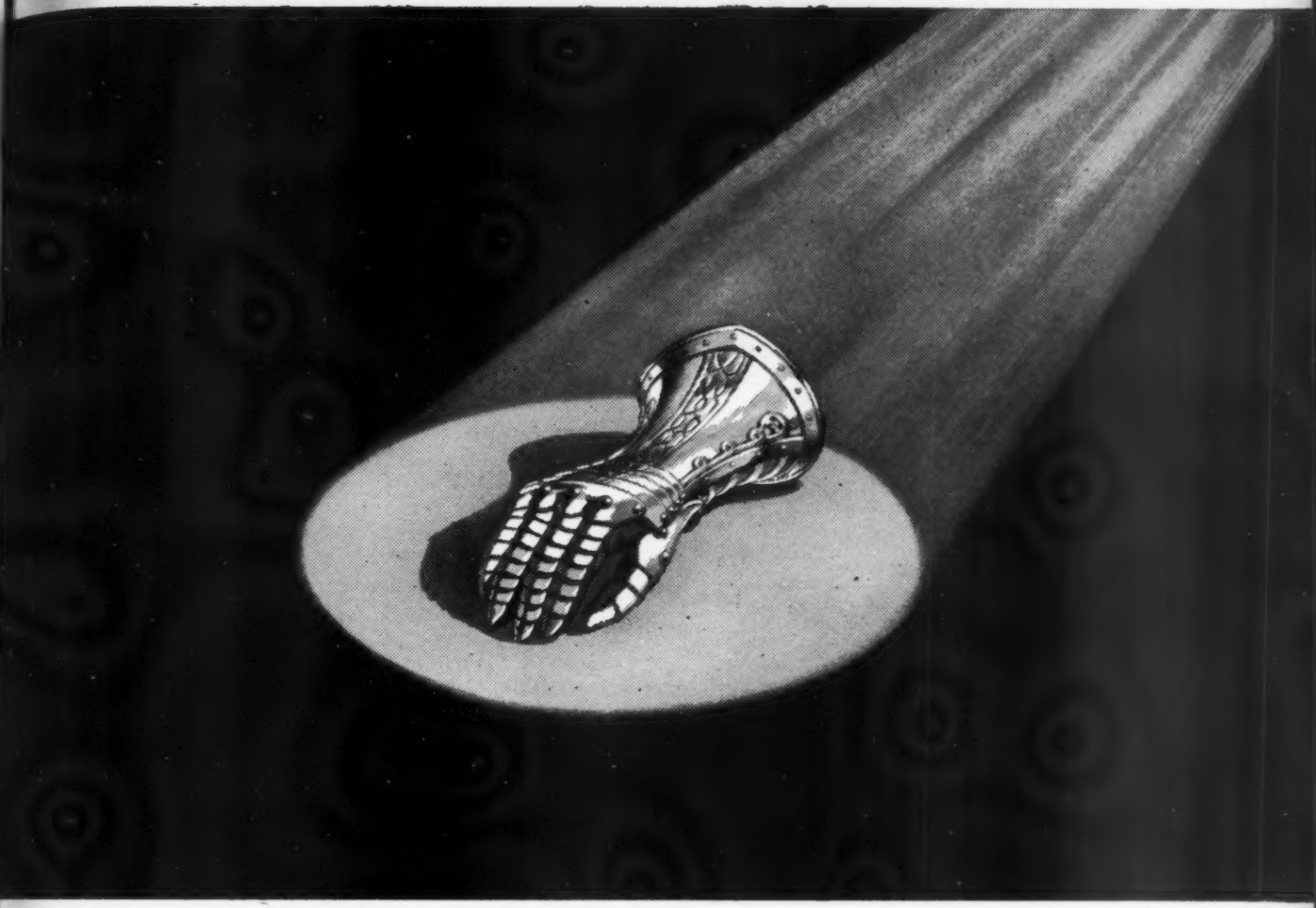
Though entitled to bargaining rights under the Wagner Act, supervisors may not be placed in the same unit with non-supervisory employees nor in a unit including supervisors of varying grades. (Studebaker Corp.)

An employer may demote a supervisor who was engaged in activity favoring one of two rival unions since, if he did not penalize him, the employer might be charged with interference.

A supervisor may not be demoted for making statements in favor of a union where another supervisor was not demoted for making statements opposed to the union. (Boeing Airplane Company.)

** Closed Shop Barred*

A Florida Court ruled that a firm doing business in accordance with the law of the state in which it was incorporated had no authority to enter into a closed shop agreement since such a contract interfered with the prosecution of the war. (Florida vs. Moore Pipe & Sprinkler Co.)



A CHALLENGE TO AMERICANS "WHO GET THINGS DONE"

Right now we are up against the hard, blunt facts of war and the grim necessity of winning it. It's the one thing that matters with no alternative but complete and final Victory.

At the same time, it's only natural to wonder about the future—to think about the time that is coming after the last shot in this conflict is fired. And you can be sure that the future will be a challenge. We won't just slip back to the world we knew before hell broke loose.

For winning the peace will call for just about as much all-out effort as all-out production does now to win the war. We will have to do something with our tremendous productive capacity—our vast industrial plants — our skilled workers.

Yes, it will be a challenge to American business ability, the kind of a challenge Americans "who get things done" like —a challenge of their capacity to organize—manage—produce. It will be a new industrial age, an age of new materials, new techniques, new precisions. Supplying the needs of that future will take all that industry can produce and deliver.

Kearney & Trecker Corporation sees that kind of an America in the years after the war and is making its plans accordingly. No matter how long and hard the fight—it's worth it for the America of tomorrow.

KEARNEY & TRECKER
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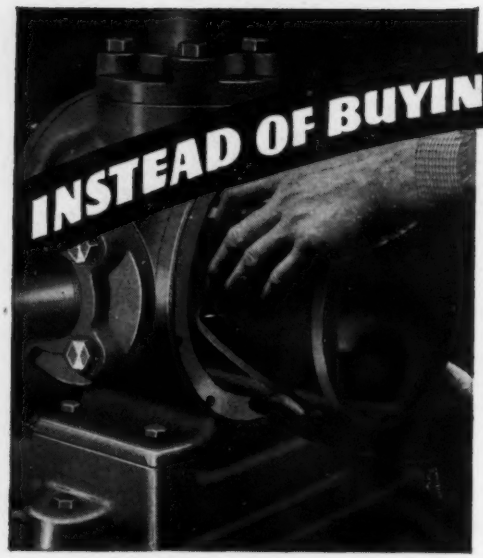
MILWAUKEE, WISCONSIN

"Buy Victory with War Bonds"

MACHINE TOOLS



INSTEAD OF BUYING A NEW PUMP

You Install A NEW LINER

When you have a Blackmer Rotary

CONSERVE CRITICAL MATERIALS

PUT THIS PUMP ECONOMY TO WORK IN YOUR PLANT NOW

Blackmer pumps with removable liners have solved many a tough pumping problem handling corrosive or mildly abrasive liquids.

- They reduce maintenance cost—you replace a liner instead of junking the pump.
- They save both replacement time and critical pump materials.

Standard units with removable liners are furnished in capacities from 20 to 750 GPM; pressures to 300 psi.

Bulletins FREE to pump users.

No. 130: BLACKMER GENERAL CATALOG
No. 301: FACTS about ROTARY PUMPS
No. SER-1: HOW TO MAKE PUMPS LAST LONGER

Write Blackmer Pump Company, 2103 Century Avenue, Grand Rapids, Michigan

BLACKMER Rotary PUMPS

"BUCKET DESIGN"—SELF-ADJUSTING FOR WEAR

Management Shorts

(Continued from page 120)

10. If drill sticks in work, do not attempt to start the drill with hand while motor is still running. Shut off the motor first.

11. Do not use compressed air unless specifically instructed by foreman. Use a hook, brush, or special tool to remove chips.

Before Leaving Machine

12. Be sure the machine is shut off before leaving.

•

Every machine that leaves the plant of George Gorton Machine Company, Racine, Wis., carries the decalcomania above, in red, white, and blue—a message from the machine maker to the machine user as a constant reminder that only by full cooperation can the war be won

•

Two years was the estimated life of a thousand-dollar jacketed aluminum tank that was being attacked by corrosive cooling water. After installation of $5 worth of zinc strips to the sides, to provide cathodic protection, the estimated life of the tank was raised to 5 years.

•

Army-Navy "E" Means "Rush" in This Plant

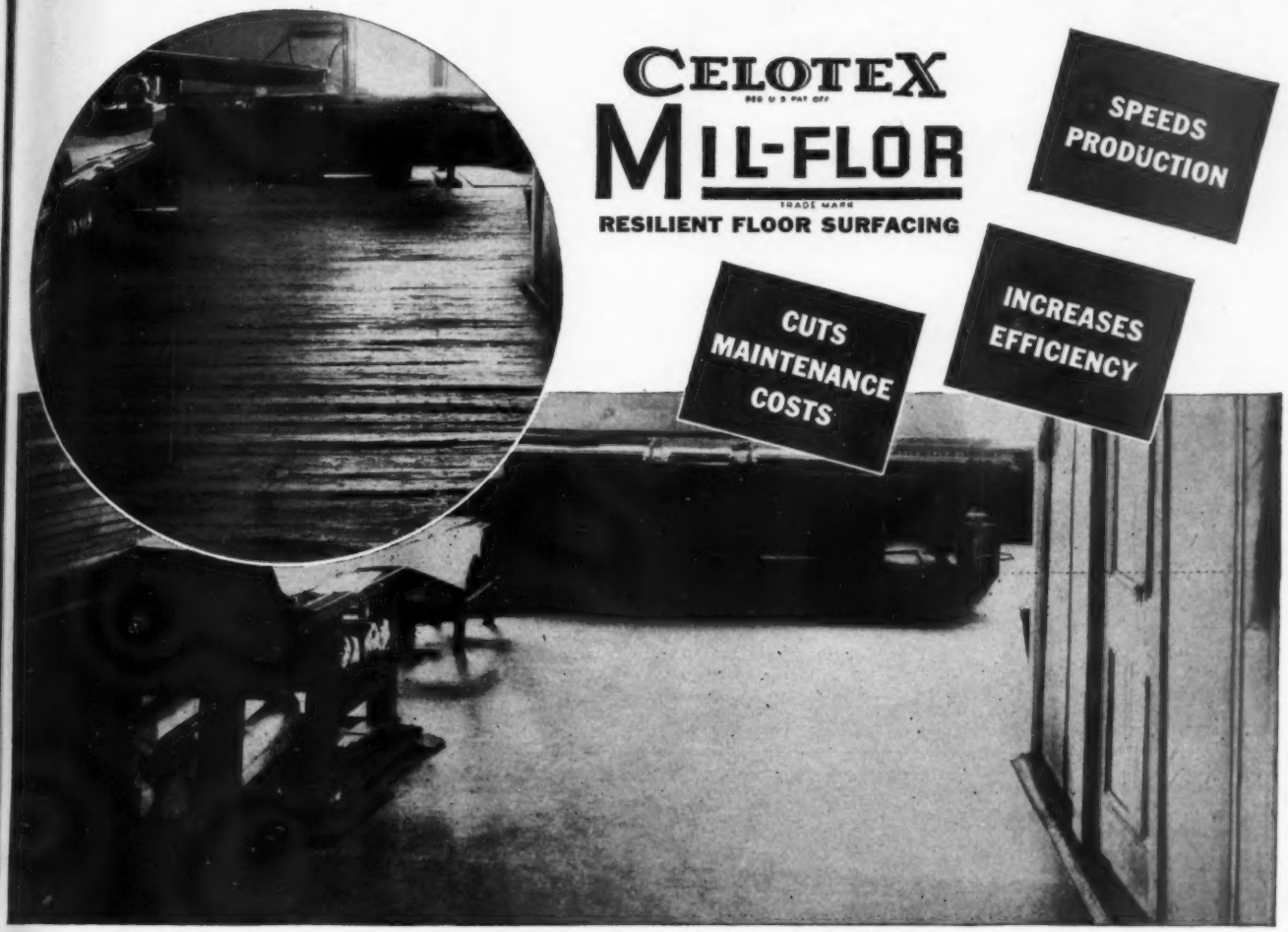
SOURCE—The Tablet & Ticket Company, Chicago

Small Army-Navy "E" stickers are being tipped onto rush orders going through production departments at Sangamo Electric Company, Springfield, Ill.

"I have a hunch," says J. H. Williams,

HOW PITTED, ROUGH, NOISY FLOORS

can be made smooth, quiet, resilient!



MIL-FLOR is easy to apply... easy to use... easy to maintain!

FOR resurfacing pitted, rough, noisy wood or concrete floors in an existing plant, or providing a smooth, quiet, long-wearing floor in a new factory, Celotex MIL-FLOR is the ideal answer!

Trucks rolling over MIL-FLOR create far less rumble to distract workers on the floor below. Feet standing on resilient MIL-FLOR find it restful, easy on endurance. Tools dropped on MIL-FLOR are far less likely to be broken or damaged. Faster factory traffic, less noise, increased efficiency—all these help speed production and reduce maintenance costs in any plant!

Whether you are erecting a new factory or reconditioning an old one, investigate MIL-FLOR! Learn how this new product stands up under hard use—cuts floor maintenance costs. Mail the coupon.

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REG U S PAT OFF
MIL-FLOR
TRADE MARK
RESILIENT FLOOR SURFACING

The word Celotex is a brand name identifying a group of products marketed by The Celotex Corporation.

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Please send complete information on Celotex MIL-FLOR Resilient Floor Surfacing.

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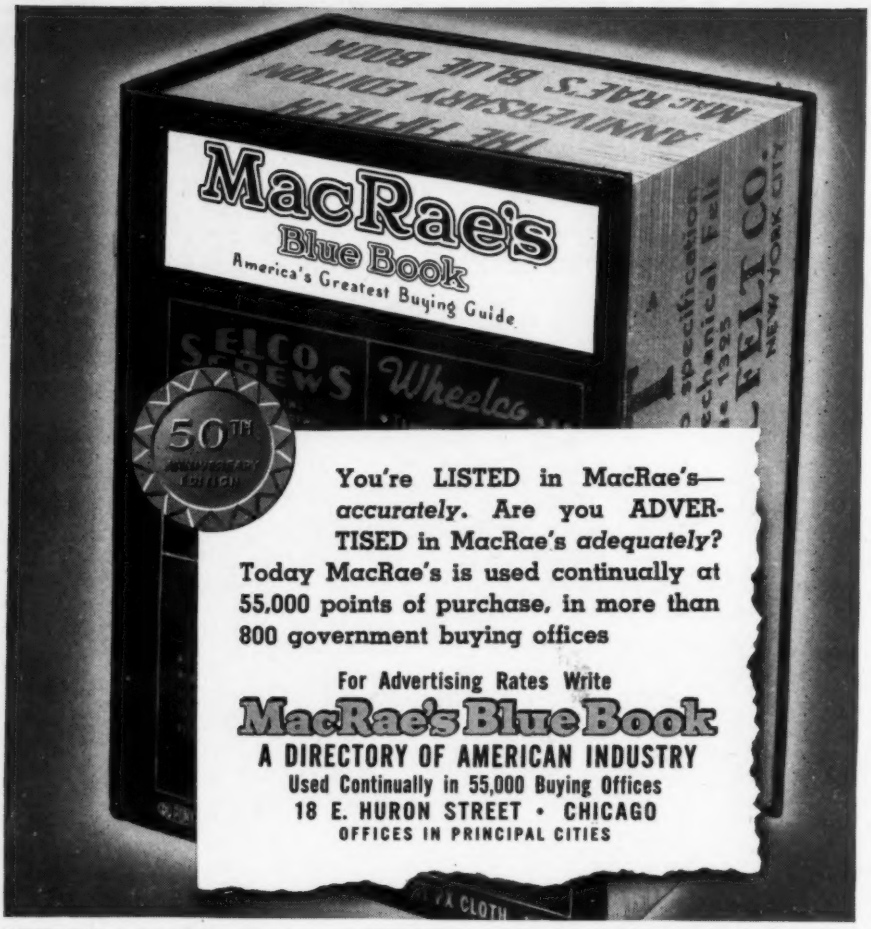
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Blue Book
America's Greatest Buying Guide
50TH
You're LISTED in MacRae's—*accurately*. Are you ADVERTISED in MacRae's *adequately*? Today MacRae's is used continually at 55,000 points of purchase, in more than 800 government buying offices
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A DIRECTORY OF AMERICAN INDUSTRY
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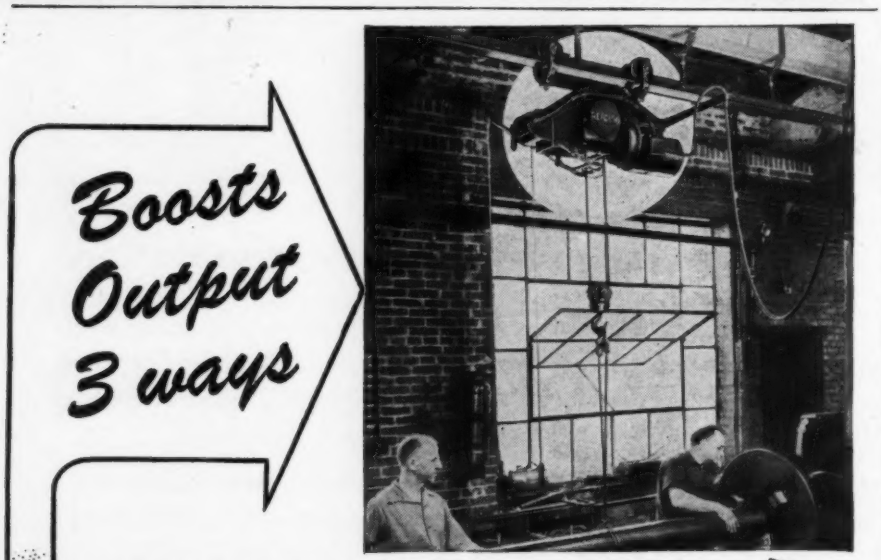
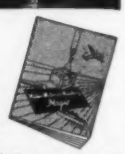


Boosts Output 3 ways

Here is a 1-ton Reading Electric Hoist that is boosting output *three ways* in a busy pipe manufacturing plant!

1. It stays on the job all day, *every day*. No "down time" or idle machines while the hoist needs repairs.
2. It *speeds* the handling of pipe to and from machines.
3. It *keeps safety records clean* by steady, sure handling of each load.

And those are just three of the "reasons why" it pays to rely on Reading's engineering ability when you have a hoist problem to solve.



Useful DATA in this 16-page booklet can help you get the most from every dollar you invest in hoists. Contains photos of parts and installations. A note on your company letterhead will start your copy of "Modern Materials Handling Magic" on its way to you.

Reading Chain & Block Corporation, 2103 Adams St., Reading, Pa.

READING CHAIN HOISTS·ELECTRIC HOISTS OVERHEAD TRAVELING CRANES

Army-Navy "E" stickers such as these rush production orders on their way

advertising manager and originator of the idea, "that the stickers will mean a good deal more than the word 'RUSH'."

•

Mechanical Lift Speeds Degreasing Operation

R. L. DUNLAP, Plant Superintendent, Yard-Man, Inc., Jackson, Mich.

A degreasing operation between the assembly bench, where parts are joined into subassemblies, and the spray booth was formerly the cause of trouble that has now been cleared up by the installation of mechanical handling equipment suspended overhead.

The operator used to lower each piece into the tank and hook it on to a crossbar. One of the tricks in the successful performance of this job is to leave the part in long enough to bring its temperature up to that of the degreasing solvent. It should then be withdrawn rather gently to avoid loss of solvent.

Hand operation fulfilled neither of these requirements. The parts usually were left in the trichlorethylene vapor either for too long or too short a time, and considerable solvent was lost in withdrawing them. In addition, it was almost impossible for the operator to time his work. He either had to wait until the parts came up to heat, or lose time when parts were left in the vapor too long.

To eliminate these troubles we installed a mechanical lift above the tank, supported from roof members by welded angle-iron framework. Attached to the sliding member is a hook on which the parts to be degreased are hung. It is raised and lowered by a roller that operates in a channel connecting the two bars of the sliding member and is carried between two parallel endless chains. Center distance between sprockets is 39 inches. The chains are driven through a speed reducer by a ½-hp., 1725-r.p.m. motor.

When the roller carries the channel cross members connecting the two bars of the sliding member to the center of the upper sprocket, a limit switch shuts off the motor. The operator then removes the cleaned parts, replaces them

The Levinson Steel Company

ESTABLISHED 1917

STRUCTURAL STEEL
PLAIN AND FABRICATED

MAIN OFFICE
33 PRIDE STREET

WORKS
20TH AND MERRIMAN STS.
SOUTH SIDE

Pittsburgh, Pa.

To our
many friends:

Quite often I find myself reminiscing on the influences that have led to our present position in the steel industry.

I shall never forget a few words of advice my father passed on to me during his late years. In essence, he spoke thus: "For twenty years I have worked hard in the metal business. I haven't much to show, except a little yard and a lot of friends. Always remember, my son, a few friends are infinitely more valuable than a lot of money. Build your business on a solid foundation; develop a good reputation; be fair, square and reliable and your business will prosper."

To the best of my ability I have always followed this advice and have passed it on to my brothers and to my son.

Our motto in those days was, "We aim to please, we seldom miss," and we really meant it. We aimed to meet every need exactingly and promptly so that as the years went by we obtained an enviable reputation for service.

That was the foundation on which was built The Levinson Steel Company. As structural steel fabricators, and in late years as fabricators of steel for industrial furnaces, conveyors, and other special equipment, we have been commended repeatedly for our excellent workmanship and fine service.

Likewise, as warehousers of steel products, our reputation for service and dependability has become nation-wide. We are proud to point out that despite periods of confusion and price irregularities, we have never charged a premium for any material from our warehouse stock.

In the last few years, when the hazards of material scarcity and shortage of time confronted all of us, there were occasions when our constructive co-operation proved instrumental in eliminating serious work stoppages and prevented break-downs. We are proud to be a part of the Nation's all-out war production. So successfully have we been serving our customers, both old and new, from coast to coast, that competitors and customers alike have congratulated us for outstanding performance.

In the years to come, we pledge never to deviate from the policy that has brought to us so many good friends. We will continue, as in the past, to be fair, square and reliable.

Cordially,

THE LEVINSON STEEL COMPANY

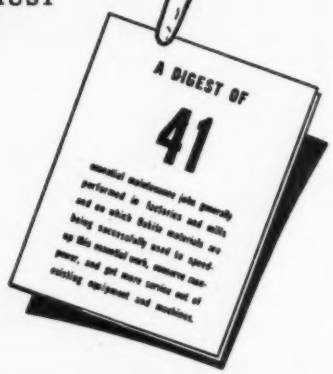
S. M. Levinson

HOW TO GET MORE WORK WITH THE HANDS YOU HAVE!

Doing maintenance cleaning "the hard way" is outmoded, especially since today neither TIME nor available MAN-POWER permits slow, laborious methods. Yet the work MUST still be done.

NEW, *FREE* DIGEST TELLS HOW!

Based on successful experience in many plants, it gives you practical help . . . tells how to do MORE work with the hands you have . . . describes 41 different, essential plant maintenance jobs. On each is outlined (1) the method followed, (2) Oakite material used, (3) fire or other hazards eliminated, (4) time saved, (5) other advantages gained. Write for your FREE copy of this informative, helpful Digest today!

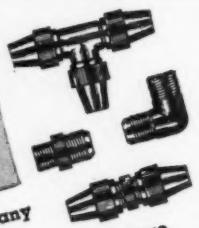


OAKITE PRODUCTS, INC., 14A THAMES STREET, NEW YORK, N. Y.

Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE MATERIALS...METHODS...SERVICE — Buy Bonds for Victory — **CLEANING** FOR EVERY CLEANING REQUIREMENT

"and Hodgman Saran solved our problem"



When the history of this period is written, this is what many firms will be able to say.

HODGMAN SARAN TUBING, PIPE AND FITTINGS are more than substitutes—they are permanent replacements for strategic materials such as copper, brass, steel, aluminum, rubber, etc. and deserve a thorough investigation by your engineering department. . . . Write today for technical data sheet and free sample.

Pat. No. 2160931

Send FOR COMPLETE INFORMATION SHEET AND FREE SAMPLE

HODGMAN RUBBER CO.

FRAMINGHAM, MASS.

NEW YORK 261 Fifth Avenue — CHICAGO 412 South Wells St. — SAN FRANCISCO 121 Second St.

with parts to be degreased, presses a button, and the cycle starts anew.

One cycle, lowering parts into the tank and lifting them out, covers a travel of 7 feet 9 inches, and takes 46½ seconds. This combination of travel and cycle time prepares the parts satisfactorily for the spray operation, although a wide range of other combinations could be worked out.

Several advantages have resulted from this installation: Solvent is saved; parts are more adequately cleaned; and the operator has a more orderly operation in that he does not have to worry about the time element. It fulfills, furthermore, a fundamental of proper layout—that work should be delivered at the point and at the time the worker needs it. A saving of 25 percent in direct labor on degreasing has been applied to other work, with a resulting better flow of production.

•

Magnifying Inspection Device Aids Output

SOURCE—Westinghouse Electric and Mfg. Co., Mansfield, Ohio

An inspection device containing a light bulb, two mirrors, and four glass magnifying lenses has helped the Mansfield plant step up production of a vital airplane part 20 percent and cut its cost 10 percent.

The instrument, known as a comparator, is used to examine acorn-sized commutators for dynamotors which supply electric power for aircraft radio equipment.

Girl on inspection line shown using magnifying inspection instrument

An image of a commutator's surface is reflected on a glass screen after being magnified 22 times its normal size. Women inspectors see that paper-thin strips of copper and mica are in perfect alignment by comparing the image with vertical lines on the glass screen. A slanted strip could create static which would interfere with radio reception in a war plane.

Inspectors complained of headaches and eyestrain as long as they used only their unaided eyes to examine the copper and mica strips, ranging in thickness from 0.018 to 0.050 inch. Powerful magnifying glasses provided some relief. With the use of the comparator, however, inspectors reported eyestrain and headaches disappeared. As a result production records

ONE UNIT · ONE ORDER · ONE SHIPMENT · ONE INSTALLATION

one

NEW LIGHT-DUTY CSP POWER TRANSFORMER REPLACES 43 SEPARATE PIECES OF EQUIPMENT

This complete factory-packaged substation is first choice for industrial service.

Its compactness and portability permit installation nearer the load center. This improves voltage regulation . . . and saves on copper runs.

The CSP Power Transformer performs all the functions of a conventional substation . . . it occupies less than one-third the space . . . and is better looking.

CSP (Completely Self-Protecting) means:

(1) Three-point protection against lightning.

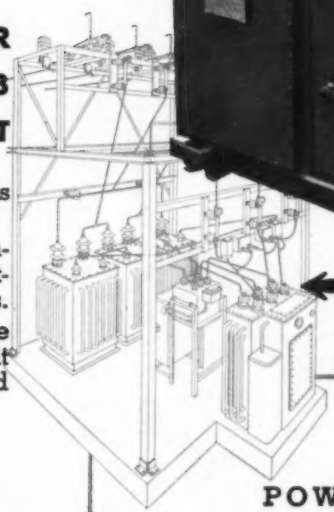
(2) Automatic protection against short circuits.

(3) Thermal protection against dangerous overloads. (Loading by Copper Temperature.)

All the thermal capacity of the transformer is made available, SAFELY . . . ideal for short-time overloads . . . conserves Critical Materials.

Ratings: 300—1000 kv-a; 50,000 kv-a breaker; 13,200—33,000 volts primary; 4160 volts secondary.

For complete information, call your Westinghouse Office or write for Descriptive Data 48-150, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N. J-70402



CONVENTIONAL SUBSTATION—with 43 components, takes up more than three times the space required by the new CSP Power Transformer.

THE CSP LIGHT-DUTY POWER TRANSFORMER:

- **Saves man-hours**—simplifies ordering, installation and maintenance.
- **Saves space**—occupies less than one-third the space of a conventional substation.
- **Saves materials**—smaller and lighter than conventional substation. Hipersil* cores save electrical steel.
- Is completely protected against burnouts.
- Is completely protected against lightning.
- Is easily moved.

* Registered trade-mark, Westinghouse Electric & Manufacturing Co., for High PERmeability SILicon steel which carries ⅓ more flux.

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

Speed Sweep Brushes

FOR FASTER, CLEANER EASIER SWEEPING

No. 411-14"

$1.95 EACH LOTS OF 12

Wire-drawn tufts.
Adjustable handle.
Highest grade bassine fibre.
Narrow light weight block with Pressed Steel back.

Heavy Duty "Speed Sweep"—the ideal brush for heavy work through grease, cutting oils, metal filings, etc. High grade bassine tufts are compact and trimmed for "spring and snap action." Study its unique construction, and you'll understand why it does a better sweeping job in less time and with less work.

Double Duty "Speed Sweep" handles fine dust as well as heavy dirt. Two center rows of tufts are of heavy bassine to handle rough dirt while the outside rows are finer Union fibre to control fine dust particles. The general construction of Double Duty Speed Sweep brushes is identical to that of the Heavy Duty Speed Sweep.

Heavy Duty "Speed Sweep" Prices

Size	6	12	24
No. 410—12"	$2.25	$1.80	$1.60
No. 411—14"	2.35	1.95	1.75
No. 412—16"	2.50	2.10	1.90
No. 413—18"	2.60	2.20	2.00
No. 414—20"	2.75	2.35	2.15
No. 416—24"	3.15	2.70	2.50

Double Duty "Speed Sweep" Prices

Size	6	12	24
No. 420—12"	$2.35	$1.95	$1.75
No. 421—14"	2.55	2.15	1.95
No. 422—16"	2.75	2.35	2.15
No. 423—18"	3.00	2.55	2.35
No. 424—20"	3.15	2.75	2.50
No. 426—24"	3.45	3.05	2.80

All brushes have 5¼" trim. Prices are f. o. b. Milwaukee

Speed Sweep brushes have been proved by so many firms and under such varied conditions that they are sold with an unconditional guarantee to meet your requirements. Full credit if you return brushes within 10 days. Order today. Shipment will be made promptly if you supply at least an A-10 rating and End Use symbols.

MILWAUKEE DUSTLESS BRUSH CO., 526 N. 22nd St., Milwaukee, Wis.

"THE NAME THAT CARRIES WEIGHT"

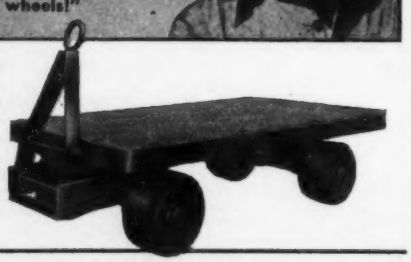
MERCER

MATERIAL HANDLING EQUIPMENT

ASK THE MEN WHO HANDLE 'EM!

"I run a Mercer No. 7 and believe you me it's a sweetheart — smoothest tonnage tackler on wheels!"

MERCER WHEEL-TRACTOR CRANES make light work of heavy loads... Available in 3 ton, 5 ton and 7 ton capacities. Gasoline-powered. One man operation. Special catalog describes complete line. Write for copy today. ★ Check Mercer first, too, on your TRAILER TRUCK requirements. All types. Capacities from 2 to 35 ton. Literature available.



MERCER ENGINEERING WORKS, INC.

30 CHURCH STREET, NEW YORK, N. Y.

Works: Clifton (Allwood), N. J.

show an increase, and the number of rejected dynamotors has been cut from about 30 percent to less than 3 percent.

•

To make sure that oxygen and acetylene cylinders do not stand idle, some shops not only return all empty ones immediately, but also keep the number on hand at a minimum by allotting not more than three of each to every two welding and cutting outfits in active service.

•

To Keep the Girls From Being Scalped

Before a woman war worker is assigned to a machine at Servel, Inc., Evansville, Ind., she is taught how to wear a bandanna. The rule is rigidly enforced. Photographs show the wrong way and the right way to protect the hair. Earrings, wrist watches, bracelets, wedding and other rings are forbidden during working hours.

Bandanna "ears" and loose, flying hair are meat for grasping machines

Tied up the right way, loose ends are tucked snugly out of harm's way

"Don't Waste Critical Materials
Save Copper, Steel, and Labor with these Combination Starters"

ALLEN-BRADLEY Combination Starters consist of a manually operated disconnect unit and a solenoid operated motor starter . . . all in one cabinet. Use them now to make the following vital savings:

SAVE MATERIALS

—Less copper to wire one unit.
—Less conduit, lock nuts, bushings, and fittings to hook up one box.
—Less steel—only one box which is much smaller than the separate disconnect switch and starter boxes.

SAVE LABOR

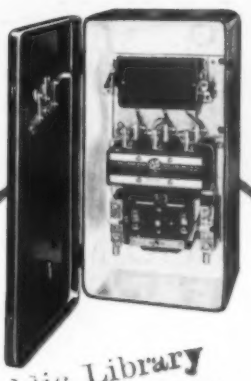
—Less time required to install one cabinet.
—Cuts wiring time in half.
—No maintenance. A-B patented silver alloy, double break contacts in both disconnect switch and starter need no dressing or cleaning. No pins, pivots, or bearings to cause trouble.

SAVE SPACE

—With only one cabinet, you get a more attractive looking installation in much smaller space.

Write for Bulletin 712.

BULLETIN 712 COMBINATION SOLENOID STARTER



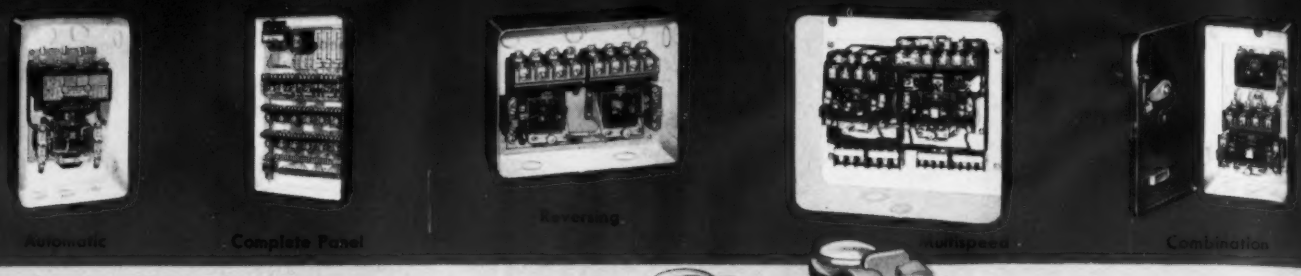
Allen-Bradley Bulletin 712 Combination Starters are available in a wide variety of enclosures.

A-B Quality

ALLEN-BRADLEY
COMBINATION STARTERS

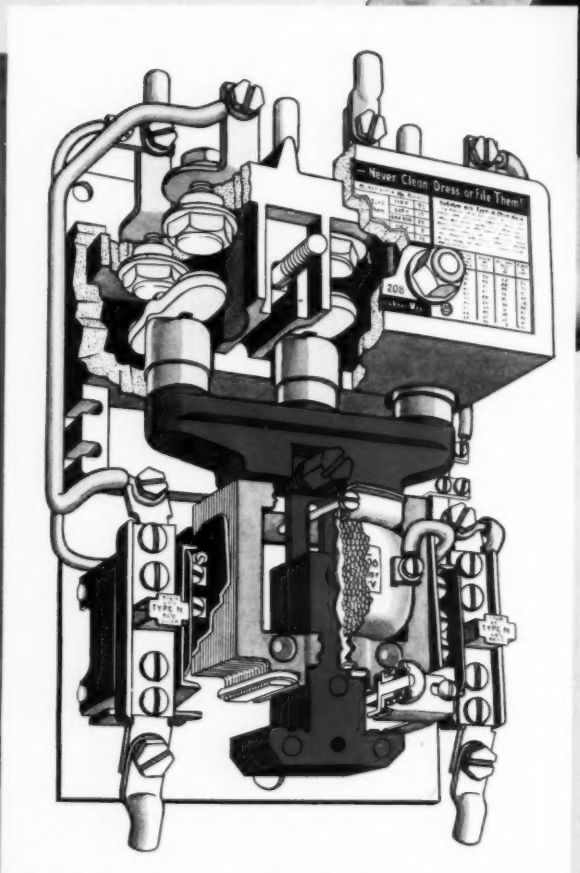
QUALITY

Public Library
Reference Dept.



No other starter is so simple

hence, so TROUBLE FREE



The only moving part . . . the vertical solenoid plunger . . . is shown in red. Arc hood is broken away to reveal contacts.

Allen-Bradley Solenoid Starters are surprisingly simple in design. They have only one moving part . . . the plunger that opens and closes the double break contacts with a straight line vertical motion.

This simple construction does away with pivots, pins, bearings, hinges, flexible jumpers, and other trouble-breeders that can gum up, corrode, or stick.

To be completely trouble-free, a starter must not only be simple . . . it must have double break contacts that can operate indefinitely without maintenance. A-B patented silver alloy contacts never need filing, dressing, or cleaning. You can install A-B Solenoid Starters . . . and forget them. They are good for millions of trouble-free operations. These features explain why A-B starters are so popular in machine tool and industrial applications.

Allen-Bradley Company, 1321 S. First St., Milwaukee, Wis.

A-B Quality

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

BOOKS

THE FOREMAN'S HANDBOOK

Edited by Carl Heyel, Union Bag & Paper Corp., assisted by a staff of specialists. McGraw-Hill Book Co., 330 W. 42nd St., New York. 410 pages. Photographs, charts, forms, index. $3.

Book does not confine itself to immediate things foreman must do, but also discusses background information he must acquire and the attitude he must develop to prepare himself for larger responsibilities. Written in understandable language, with data carefully chosen to be of service after the war as well as under present conditions.

WARTIME SUPERVISION OF WORKERS

Richard S. Schultz, Director, Methods for Industrial Relations, Inc. Harper & Bros., 49 E. 33rd St., New York. 206 pages. Photographs, drawings, forms, index. $2.25.

Placing at the disposal of every man responsible for getting out production, from foreman to top executive, the answers on how to handle the human factors that influence the speed of output. Information is the result of a coast-to-coast survey that included superintendents, factory managers, and staff personnel. Presented by the question-and-answer method are one hundred problems which affect good morale and top performance.

FOREMANSHIP AND SAFETY

C. M. MacMillan, Associate Engineer, Safety and Security Branch, Office of the Chief of Ordnance, War Department, Chicago. John Wiley & Sons, Inc., 440 4th Ave., New York. 101 pages. Photographs. $1.

Intended as an easily read book which may be referred to readily and will not only help in foreman training but will also aid in solving the foreman's daily safety problems. Each chapter is divided into two parts—general information on the subject being treated, and a prepared talk for the foreman to give his men.

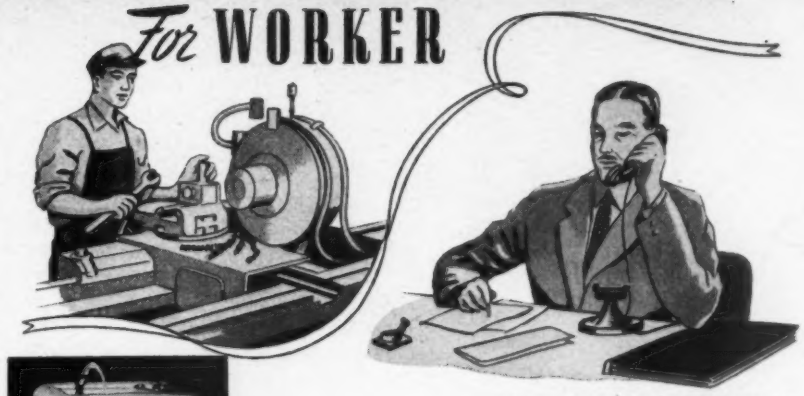
PUBLIC LIBRARY SERVICE TO BUSINESS

Business Branch of the Public Library, 34 Commerce St., Newark, N. J. 215 pages. $3.50.

A detailed study of procedures in libraries of many sizes, and a comparative study of the development of the service in cities over 70,000. Book provides an account of the practices followed in selecting and maintaining business collections of all types; an analysis of the use and relation of cost to use; a description of the methods used in relating the work to the business community; statistical data on budget costs, hours, size of staff; a record of the resources in various directories.

BOOKLETS

PATENTS AT WORK—A statement of policy by the alien property custodian of the United States. Alien Property Custodian, Chi-



For WORKER ... or EXECUTIVE

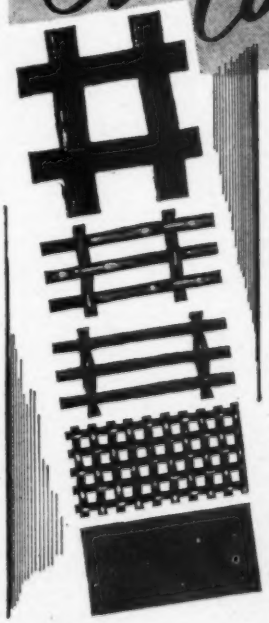
So much depends on maintained top-speed production that it is almost axiomatic to say plant personnel must be kept fit! • For the worker, clerk, stenographer, or key executive, Halsey Taylor Drinking Fountains and Coolers are an essential investment, providing a source of constant, health-safe drinking water at convenient points. Get our complete catalog of fountains for Industry!

THE HALSEY W. TAYLOR CO.
WARREN, OHIO

HALSEY TAYLOR
AUTOMATIC STREAM CONTROL • TWO-STREAM PROJECTOR
DRINKING FOUNTAINS

Of Course you can get

WIRE CLOTH IMMEDIATELY!



Countless rolls and pieces of "Buffalo" industrial wire cloth are regularly stocked for immediate shipment. Frequently, you can fill your requirements from these stocked items and save weeks from delivery dates of specially woven cloths.

How can you keep posted on what's currently stocked? Buffalo Wire Works publishes and mails monthly an attractive Stock List showing a wide variety of lengths, widths and grades available at once. This is a free service—no obligation. Send your name, title, company and address today and you will be placed on the mailing list.

AVAILABLE AT ONCE ON PRIORITY
1000 ft.
COMMERCIAL BRONZE
24 in. wide
2x2 mesh
18 W & M gauge

Material from stock is cut to any desired length. Complete production services include trimming, die cutting, welding, soldering, binding and fabricating into finished products.

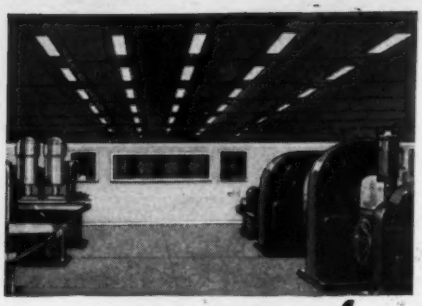
Whatever you may require in wire cloth, not listed in the Stock List, can be woven to order.

FREE STOCK LIST
Mailed Monthly On Request

DOING BUSINESS FROM COAST TO COAST FOR 74 YEARS

Buffalo WIRE WORKS CO., INC.
ESTABLISHED 1869 AS SCHEELER'S SONS

440 TERRACE BUFFALO, N.Y.



Controlled Starting

Means LONGER LAMP LIFE

and that's what G-E Starters give you

Rigid tests on delicate instruments such as the cathode-ray oscillograph prove that G-E Starters are properly designed to prolong the life of your fluorescent lamps.

In all G-E Starters, preheating of lamp electrodes is accurately timed to start the lamp at the precisely right moment—not before, not after. This accurate timing saves lamp emission material vital to long lamp life.

In all G-E Starters, the constant breakdown voltage is maintained throughout the life of the starter at a point where it will not interfere with good lamp operation. Again, lamp life is prolonged through proper design.

The G-E "Master No Blink" Starter is a major contribution to better fluorescent lighting. A manual reset starter, it completely eliminates blinking and flickering, and saves you power, maintenance time and war-vital materials. It instantly cuts out a dead lamp from the circuit. No current is used to keep the lamp locked out and none is wasted trying to restart the dead lamp. No wasteful wear and tear are placed on the starter and ballast.

THE WHOLE STORY'S IN THIS CATALOG

Complete data on G-E Accessories and their proper use for best fluorescent lighting may be had by writing to General Electric, Section G331-57, Appliance and Merchandise Dept., Bridgeport, Conn.

GENERAL ELECTRIC

cago. 25 pages. Also folder, "Index of Patents vested in the Alien Property Custodian as of January, 1943." No charge.

METHODS OF MEASUREMENT. Wendell H. Cornetet, Head, Department of Vocational Science, Huntington East High Trades School, Huntington, W. Va. McKnight & McKnight, Bloomington, Ill. 135 pages. Drawings. Also "Tests for Methods of Measurement," 15 pages. 95c.

DO WE WANT A FEDERAL SALES TAX? Charles O. Hardy. 47 pages. The Brookings Institution. Washington, D. C.

CONTROLLING FACTORY PRODUCTION—for fuller use of manpower and machines. Policyholders' Service Bureau, Metropolitan Life Insurance Co., 444 Madison Ave., New York. 34 pages. Forms. No charge.

•

ON THE CALENDAR

MARCH

23–25, Safety Engineers, Annual Convention, Hotel Pennsylvania, New York. Greater New York Safety Council, Lincoln Building, 60 East 42nd St., New York.

25–27, American Society of Tool Engineers, Machine and Tool Progress Exhibition, Milwaukee Auditorium, Milwaukee. Executive Secretary, Ford R. Lamb, 2567 West Grand Blvd., Detroit.

APRIL

9–10, Midwest Power Conference, Palmer House, Chicago. Stanton E. Winston, Conference Director, Illinois Institute of Technology, 3300 Federal St., Chicago.

13–16, American Management Association, Packaging Conference, Astor Hotel, New York. James O. Rice, Assistant Secretary, 330 West 42nd St., New York.

20–23, National Electrical Manufacturers Association, Spring Meeting, Palmer House, Chicago, R. J. Blais, Convention Manager, 155 East 44th St., New York.

26–28, American Society of Mechanical Engineers, Spring Meeting, Black Hawk Hotel, Davenport, Iowa. C. E. Davies, National Secretary, 29 West 39th St., New York.

28–30, American Foundrymen's Association, 47th Annual Meeting, Hotel Jefferson, St. Louis American Foundrymen's Association, 232 West Adams St., Chicago.

MAY

10–11, American Institute of Chemical Engineers, Semi-Annual Meeting, Waldorf-Astoria, New York. Stephen L. Tyler, Secretary, 50 East 41st St., New York.

10–14, National Fire Protection Association, Annual Convention, Palmer House, Chicago. Percy Bugbee, General Manager, 60 Batterymarch St., Boston.

24–26, National Association of Purchasing Agents, Annual Meeting, Waldorf-Astoria, New York. G. A. Renard, Secretary, 11 Park Place, New York.

To Help Maintain War Production

M H

VALVES HYDRANTS

and

PIPE LINE ACCESSORIES

M & H products are well known for high quality material and expert workmanship. They have been used in industrial plants for many years. The M & H line also includes B & S Cast Iron Fttings, Flanged Fittings, Flange and Flare Fittings, Valve Boxes, Shear Gates, Wall Castings, Cutting-in Tees and similar accessories.

M & H Valves are used in industrial plants for water, gas, steam, oil, chemicals and are furnished in all commercial sizes from 2" to 30", inclusive. They are cast iron body, bronze mounted, furnished double disc parallel seat or solid wedge. They are heavily proportioned and have a high factor of safety.

OTHER M & H PRODUCTS

Fire Hydrants	Floor Stands
Gate Valves	Extension Stems
Tapping Valves	Mud Valves
Special Castings	Flap Valves
Tapping Sleeves	Sludge Shoes
Check Valves	

Write for Catalog 34

M & H VALVE AND FITTINGS COMPANY
ANNISTON, ALABAMA

TRUCKS AND CASTERS on Every Front

PRODUCTION front and battle front—both demand speed and mobility. Since all Colson products roll on wheels or casters, Colson equipment plays a vital part in aiding production, health, comfort and speed for *both* fronts.

Air fields, ships, army quarters, loading docks, even hospitals as well as war materiel plants—wherever movement of goods and parts must be swift and sure—have called on Colson for aid. 100% of all Colson manufacture today goes to help win Victory.

THE COLSON CORPORATION

ELYRIA, OHIO

Sales Offices and Dealers in Principal Cities

Casters • Industrial Trucks and Platforms • Lift Jack Systems • Bicycles • Children's Vehicles

Wheel Chairs • Wheel Stretchers • Inhalators • Tray Trucks • Dish Trucks • Instrument Tables

Keeping Machinery Busy
For Over 30 Years
that's Been the Job of
THE SERVIS RECORDER
Bolted right on to any machine, the Servis Recorder makes a daily record of Busy Time, and, more important still —IDLE TIME. Then what happens? You get busy, and you eliminate much of that idle time.
Increase Production Time 20%
This often happens. But today, when machines are scarce, this means more than merely saving money; it means:
Creating New Machines Out of Thin Air
You see how that happens. It's a good thing to happen right now! Send for our folder —"A Busy Plant!" THE SERVICE RECORDER CO., 1375 Euclid Ave., Cleveland, O.
IT'S ALL ON THE CHART
POINTS OUT ALL DELAYS
The Servis Recorder
The "Time Clock" for Machinery

INSPECTION and WORK IDENTIFICATION STAMPS
NOW MADE IN AN
Amazing New Material
Results of tests in actual production have shown that Matthews new "S-22" Synthetic outlasts the best rubber or other synthetic stamps from three to four times! The new "S-22" Synthetic is unaffected by acid etching inks.
PIN for POSITIVE HOLDING
The popular Peg Style illustrated is used where large volume inspection stamping of metal parts and assemblies is required.
WRITE FOR BULLETIN S-CATALOG 146
This valuable bulletin illustrates the various styles of stamps available. Write for your copy today!
JAS. H. MATTHEWS & CO.
3951 Forbes Street Pittsburgh, Pa.
Branch Plants
New York, Boston, Chicago, Philadelphia, Newark, Syracuse
District Sales Offices
Cleveland Detroit Hartford Birmingham

Late Developments In Manpower

(Continued from page 90)

48 hours if such an increase would make necessary the release of any of his present employees. If, by that date, he has not introduced the 48-hour week because it would involve the release of some employees, he will advise the area representative of the WMC of the number of employees that would be released by the lengthening of the work week, and will at the same time present a proposed schedule for the release of such workers or for their further absorption within his own establishment. The area representative will then authorize a schedule of employee release that is appropriate in terms of local labor market needs.

5. Where employers have not attained a regular 48-hour work week for full-time workers by March 31, 1943, because of shortage of materials or other special circumstances beyond their control, their cases will be reviewed at that time by the area representative of the WMC, and provision will then be made for adjustments.

Questions and Answers

Millions of employees are affected by the shift to a 48-hour week. Thousands of employers are involved. Countless questions will be raised—in anticipation of which the War Manpower Commission has worked up the following series of questions and answers designed to help industry clear the decks for action:

1. *Does this order apply to everyone in this country?* No. At the outset, WMC is making it mandatory in 32 areas where labor shortages already exist. It will be extended to other areas as shortages become acute.

2. *Does it apply to everyone in these areas?* To all full-time employment. If you don't employ anyone but yourself, it doesn't apply.

3. *How about part-time workers?* No. It doesn't apply. Here, however, both employer and employee have an obligation to their country and to themselves to contribute to the extent of their ability.

4. *Should firms in other areas try to go on the 48-hour week?* Yes, if by doing so they can reduce their labor requirements and not have to discharge workers now on their payrolls. Most war plants in all areas are ex-

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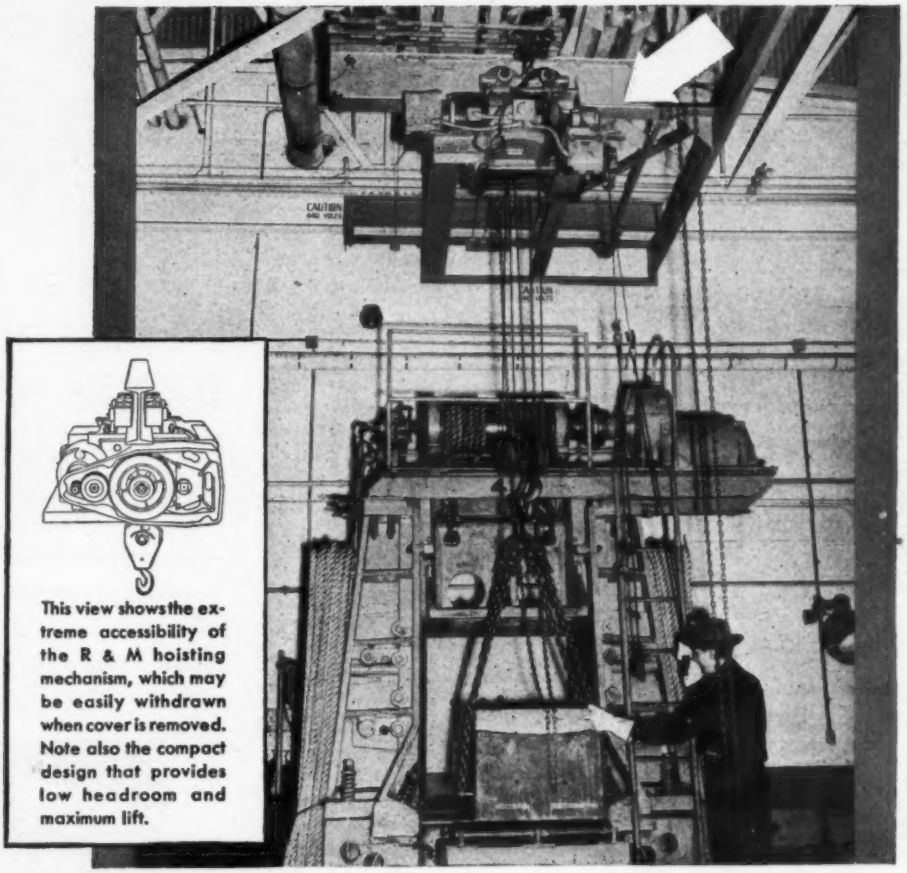

This view shows the extreme accessibility of the R & M hoisting mechanism, which may be easily withdrawn when cover is removed. Note also the compact design that provides low headroom and maximum lift.

WITH speed and perfection the double-barreled order of the day at the Nashville Division of Vultee Aircraft, Inc., materials, dies and assemblies must be *where* they're wanted *when* they're wanted. That's why Vultee—like hundreds of other leading war-busy firms—trusts vital lifting and conveying jobs to a squadron of R & M Electric Hoists.

Illustrated above is a typical R & M application. This 5-ton hoist, mounted on an overhead trolley, is removing a heavy die from a large drop hammer. It also serves several other hammers—a job that calls for the utmost in speed, safety and accuracy.

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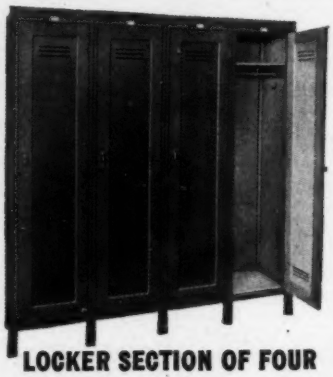

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panding their work weeks for better utilization of available labor. Non-war plants would be well advised to plan similar action, in view of the drain of their workers into the armed forces and into war industries.

5. Must time and one-half be paid for all time over 40 hours in any and all employment? Yes, with certain exceptions. The President's order provides expressly that no change is made by it in any collective bargaining agreement as to the rate of overtime pay. The order abrogates labor contracts which restrict the work week to less than 48 hours, in the areas to which the mandatory order is applied.

6. What about jobs not covered by the Wage-Hour Act? The order does not require time and one-half for overtime worked by these people.

7. Should a store or office now working employees less than 48 hours go up to 48 hours at once? Yes, but only if going to 48 hours would result in more effective use of employees, or if it would avert employment of additional employees. However, the purpose of the order is to release workers for war and essential jobs. Mere increase of hours that will not result in this was not intended.

8. Who is putting the order into effect and enforcing it? The War Manpower Commission was directed by the President to interpret and apply the order, and to permit longer or shorter work weeks if they will help win the war.

9. When is the order effective? Immediately in the 32 areas already designated. Workers should be paid overtime rates as overtime is instituted. However, WMC has announced that employers have until March 31 to bring their work weeks up to 48 hours, or to report how much longer it will take them to do so.

10. Does the order apply to establishments whose hours are limited by state law? No. The order says "nothing in this order shall be construed as superseding or in conflict with any federal, state, or local laws limiting hours of work."

11. With whom should local plant, union, and employer problems, created by the order, be taken up? With area or regional officials of WMC, which intends to decentralize administration of the order as much as possible, leaving decisions in the hands of local WMC officials and their management-labor committees.

12. How can the order be enforced, if an employer is recalcitrant? All departments and agencies of the federal

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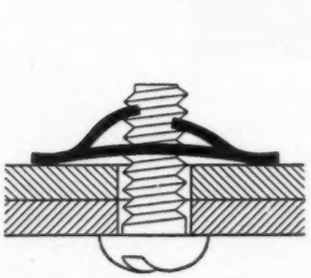

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government will require their contractors to comply with the order. The U. S. Employment Service which has control of hiring in the areas will not refer employees to any employers not complying with the order unless they are specifically exempted from its terms by WMC. Smaller establishments not influenced by these conditions will probably comply for patriotic or economic reasons. Few objections are expected.

13. Suppose an employer or worker contends that the 48-hour week is impossible in his shop or plant? The WMC will investigate and make such exceptions or exemptions as will permit the fullest possible contribution to the war.

14. Does the order apply to coal miners, most of whom have a 35-hour week under union contracts? The first areas designated include no coal-mining centers. But successful efforts are being made to have the work week extended in many areas to meet war fuel needs. Some hazardous occupations or industries may be exempted.

15. How much additional productive power is made available by this order? No statistics are available. It has been estimated that, if the 48-hour week were in effect in all industries and areas where it would result in the maximum use of labor, it would add the equivalent of 1,000,000 men to the labor force.

16. Will the 48-hour week be applied in the steel mills of Detroit and Buffalo, which are labor shortage areas, and not in Pittsburgh, which is not now listed as a labor shortage area? This will be decided later, upon investigation by WMC and consultation with the industry, to determine whether or not it is possible or feasible. A few industries may have to be handled on an industry-wide instead of an area basis.

17. Will OPA permit prices to be raised on a showing of increased costs? That is governed by OPA regulations, but it is unlikely that the increased labor cost will add more than a small fraction to the cost of production.

18. Does the order apply to government arsenals and navy yards? Yes, but practically all these are already on a work week of 48 hours or more.

19. What about government offices? The government recently adopted a 48-hour work week for the duration, with overtime pay for work in excess of 40 hours as fixed by federal law.

20. Does the order apply to newspapers and retail stores? Yes, in the

Many of America's great manufacturers who are beating their schedules—know and rely on Standard Conveyors for a smooth, uninterrupted flow of work in process. Standard Conveyor engineers have helped them to streamline their handling methods—to keep production synchronized—to utilize every square foot of working space more effectively—to make man-hours count more in increased production. Standard power or gravity conveyors can provide fast, smooth "runways" for your output through all steps in manufacturing. Send for the 84-page "Standard" booklet FM-3, showing conveyor applications and possibilities in a wide range of industries.

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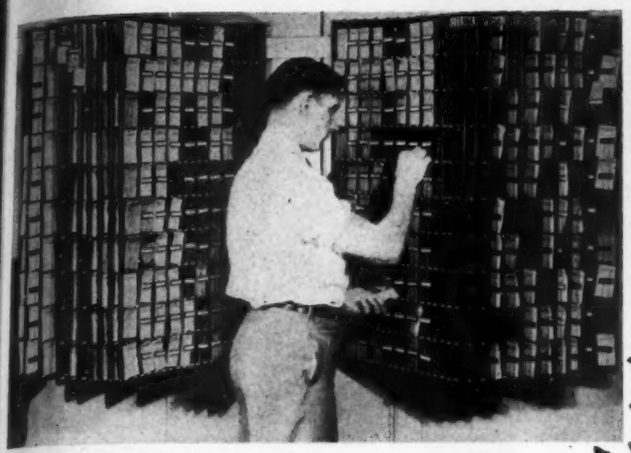

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critical areas. But it should be emphasized that the purpose of the order is to economize on manpower and not to increase hours of work where it will not contribute to the war effort.

21. What about the little one-man business and professional people like doctors and dentists? The order applies only to employment, and self-employed persons are not regarded as employees.

22. Does the order apply to laundries? Yes, in critical areas.

23. Suppose an employer declines to increase the weekly pay of an employee although he increases the work week to 48 hours. What can the worker do? If the employer is governed by the Wage-Hour Act, he is required to pay time and one-half for all overtime over 40 hours in a week. There is no law covering the employer whose workers are not covered by the act. However, such an employer as described in this question would be likely to lose his employees to employers who are paying time and one-half for overtime.

24. Could an employer get away with paying a worker straight time for pay over 40 hours? If the worker is covered by the Wage-Hour Act, the employer would be violating federal law. If the worker is not covered, he would be likely to leave his job for employment with an employer who is paying time and one-half.

25. Should state and local governments adopt the 48-hour week under this order? Yes, if their employee's hours of work are not fixed by state or local law. The order does not change any rate of wage or overtime fixed by local, state, or federal law.

Three WMC Bureaus

For most effective mobilization and utilization of manpower, every man or woman physically able to render personal service in the war effort must have the opportunity to serve in an essential activity; to engage in an endeavor that will utilize to the highest degree his or her particular abilities most needed in the war effort; to perform at his or her highest production rate; and to continue such performance during the maximum working hours that are commensurate with good health and sustained effort.

In substantially those words Chairman McNutt defines the task that faces WMC. For most effective mobilization of manpower, three bureaus have therefore been functioning: *Selective Service*, which serves to take people from civilian activity into the

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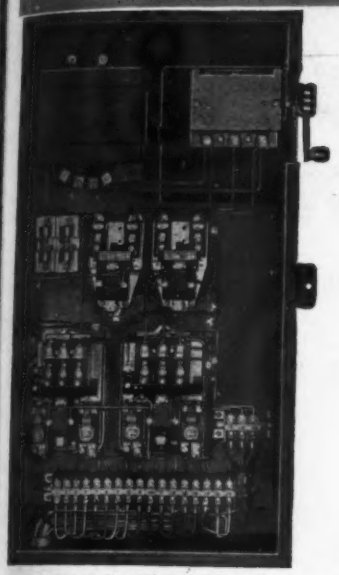
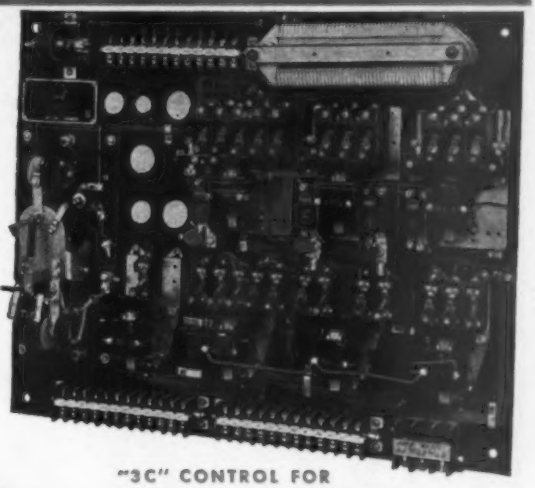


SPECIAL "3C" MACHINE TOOL CONTROL PANEL



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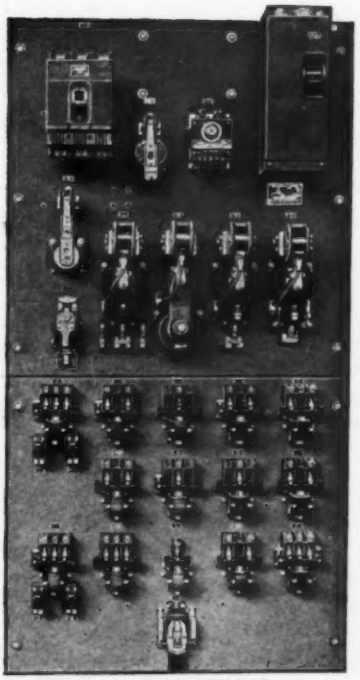

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"Will it deliver production line service?" is the first question asked of our apparatus, for continuous START-STOP operations demand exceptional service and durability.

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armed forces; *placement*, which takes people from unemployment or less essential activities into essential activities, and from one essential activity to a still more essential one; and *training*, which serves to prepare people for essential activities.

Effective mobilization, however, does not presuppose best utilization of manpower in the war effort. Utilization goes far beyond mobilization and involves the uses to which people are put after they are placed in essential activities, and the extent to which their skills and knowledge are made productive.

There have been alarming signs that manpower was not being most effectively utilized. Manpower is unquestionably being wasted.

A New WMC Service

WMC has recognized the gravity of the situation in its establishment of a fourth bureau—a manpower utilization service—to assist management and labor in a mutual search to increase the effectiveness of human endeavor. This service was announced on February 10 after consultation with, and following the advice and recommendations of a committee representative of management and labor.

This new agency, closely related to the other three bureaus of WMC, but separate and distinct from them, is to be known as the Bureau of Manpower Utilization, and has been placed under the jurisdiction of the executive director of WMC, Lawrence A. Appley.

Three subdivisions have been set up—agricultural, industrial, and governmental—and each will employ manpower utilization consultants to help management and labor find out, in the individual plant and production unit, how effectively the people on the job are performing, and to suggest ways and means of increasing their effectiveness.

How will these manpower utilization consultants work?

"They will come into your plant," says Governor McNutt, "and work with you and for you in:

"1. Determining the extent to which manpower and woman power are being utilized by analyzing such symptoms as absenteeism, labor turnover, production restrictions and stoppages, low morale, performance on the job, idleness, the use of women, physically handicapped, etc.

"2. Analyzing personnel methods as to what methods you are using, the balance of an emphasis upon each method, management and labor support, timing, etc.

"3. Setting up an over-all plant

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How and why AerVoiDs are going into war plants in constantly increasing numbers, in the words of the users themselves, is told in a new circular.

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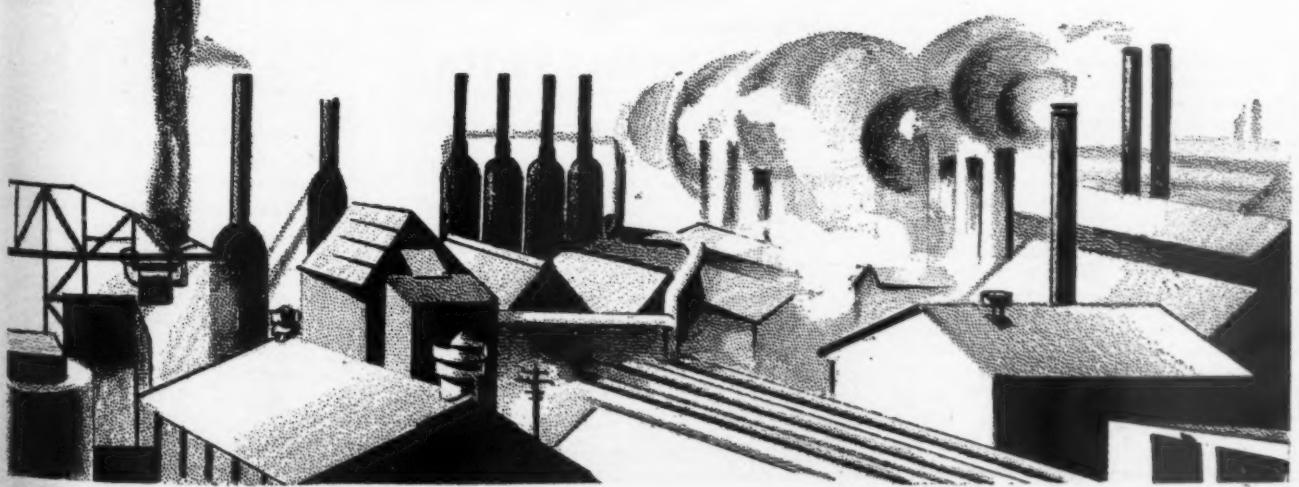

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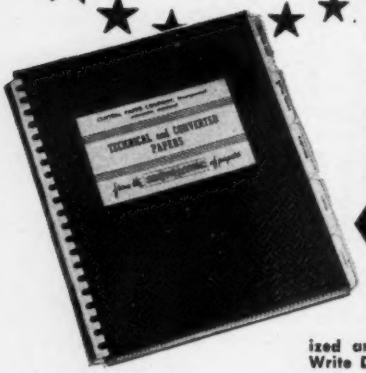

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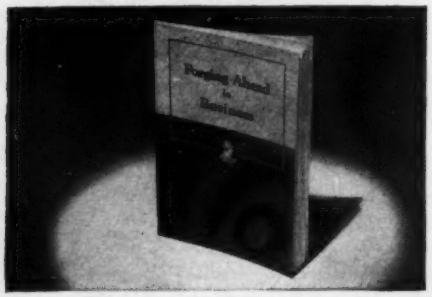

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SIZE: 7" long, 4" wide, 3¼" high.
WEIGHT 5¼ lbs. FINISH: Light gray enamel.

Almost like having a "third hand" at every machine. Offers maximum safety features; especially valuable where unskilled or semi-skilled labor is employed. "Linemaster" is fully enclosed; hooded for protection against dirt and tampering.

No. 4141-D (Press to start; press to stop) $7.50
No. 4141-S (Hold down for closed circuit) $8.50

SIMONDS MACHINE CO., INC.

SOUTHBRIDGE, MASSACHUSETTS

program of manpower utilization based on the studies just outlined.

"4. Suggesting other WMC services available to you, such as placement and training, and establishing contacts for you.

"As their tools for rendering service they will have occupational analyses, worker analyses, manning tables, replacement schedules, and common sense."

Defines War Jobs

A war job, the War Manpower Commission points out, does not mean merely a job in aircraft or ships, ordnance or ammunition. People must be housed and clothed and fed in wartime as well as in peace. Essential civilian activities are therefore on an equal footing with the most basic war industries.

As to non-deferable occupations and activities, WMC states that men of military age currently employed in such occupations and activities should not now leave their jobs merely because the occupation appears on the non-deferable list. WMC emphasizes that the transfer is to take place in an orderly manner. Such men are urged to register at the local employment office of WMC in order that the most effective placement of manpower in the war program may be assured. WMC points out further that failure to include a specific activity in the list of essential activities does not mean that the non-deferable occupations and activities policy is applied to such an activity. Many occupations in activities not included in the list of essential activities involve skills which are extremely important to the war program.

The list of activities that have been declared essential follows:

- Production of aircraft and parts
- Production of ships, boats, and parts
- Production of ordnance and accessories
- Production of ammunition
- Agriculture and fishing
- Processing of foods
- Forestry, logging, lumbering
- Construction
- Coal mining
- Metal mining
- Non-metallic mining, processing, and quarrying
- Smelting, refining, and rolling of metals
- Production of metal shapes and forgings
- Finishing of metal products
- Production of industrial and agricultural equipment
- Production of machinery
- Production of chemicals and allied products, and essential derivatives
- Production rubber products
- Production of leather products
- Production of textiles
- Production of apparel

(Continued on page 248)

DELIVERIES ARE TOUGH THESE DAYS BUT...

We're trying to lick them by confining our manufacture to the most popular sized hoists

We suggest, for the present, that if you have a materials handling problem, you write promptly or telegraph us for full information on a Lo-Hed Hoist to meet your needs.

WHAT "BALANCED CONSTRUCTION" MEANS TO YOU

The *balanced* arrangement of motor and drum in a Lo-Hed Hoist allows the hook to be pulled up until it almost touches the beam, giving you minimum headroom—a desirable plus feature for which you pay no premium. This same arrangement makes possible the use of an all spur gear drive from motor to drum.

FEATURES OF LO-HED HOISTS...

HEAVY DUTY HOIST MOTOR: Built especially for hoist service. Ball Bearing. Fully enclosed.

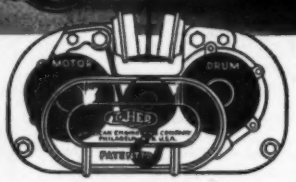
STRONG, SHORT SHAFTS: For strength. Bearing races pressed on ends of shafts to eliminate shaft wear.

HIGH DUTY BEARINGS: On gear shafts and trolley wheels. All main bearings operate in oil bath.

100% POSITIVE AUTOMATIC STOP: Shuts off current and applies holding brake automatically at upper limit of travel.

STRAIGHT LINE SPUR GEAR DRIVE: All spur gear for efficiency.

COVERS: Gearing sealed in oil bath. Controller, motor and drum protected by removable steel covers.

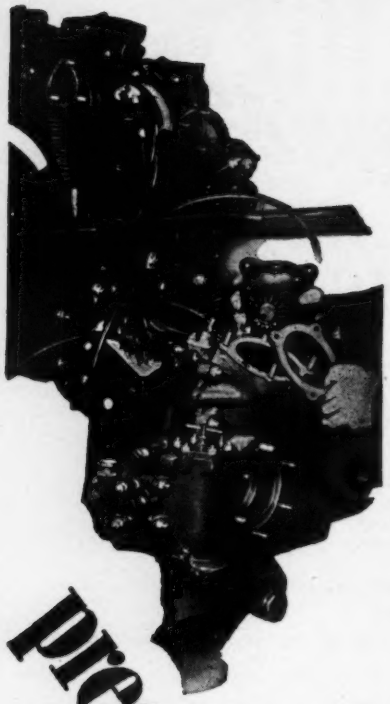


Other A-E-CO Products:
TAYLOR STOKERS
MARINE DECK AUXILIARIES
HELE-SHAW FLUID POWER

The Lo-Hed Hoist can be adapted for operation on any monorail system. There's a Balanced Lo-Hed Electric Hoist for Every Purpose.

AMERICAN ENGINEERING COMPANY (AE CO)

2426 ARAMINGO AVENUE
PHILADELPHIA, PENNA.



precision . . . quick

In close-precision aircraft adjustments . . . *quick* accuracy is insured by Laminum shims. From factory assembly to vital field servicing! Laminum shims (easily peeled precision brass laminations) are cut to your specifications.

Stock shim materials obtainable from mill supply dealers. (Write us for shim application folder and Laminum sample.)

Laminated Shim Company, Inc.
54 Union St., Glenbrook, Conn.

it's

LAMINUM

THE SOLID SHIM THAT *peels* FOR ADJUSTMENT

(*Continued from page 246*)

Production of stone, clay, and glass products
Production of petroleum, natural gas, and petroleum and coal products
Production of finished lumber products
Production of transportation equipment
Transportation services
Production of materials for packing and shipping products
Production of communication equipment
Communication services
Heating, power, water supply, and illuminating services
Repair services
Health and welfare services
Educational services
Governmental services
Technical, scientific, and management services

Check List of Causes of Manpower Wastage

There is nothing revolutionary about this whole idea of maximum utilization of manpower. It is a goal that management is always seeking, but never fully attains.

"The best-informed observers," to quote J. Douglas Brown, Director, Industrial Relations Section, Princeton University,* "agrees that there is a tremendous labor potential still unused within industry's own backyard. This labor potential may well exceed the equivalent of 5,000,000 man-years, not of services of new, green labor, but of men and women already a part of the experienced personnel of industry. . .

"Maximum utilization means higher production, higher earnings, and earlier victory. For the employee it is by no means synonymous with greater sacrifice of physical energy, happiness, and health, but rather with a greater contribution to the war effort through the more effective utilization of an *optimum* daily amount of time and energy."

To help industry attain this maximum utilization of manpower, Professor Brown has worked up the following check list of the causes of wastage in utilization of employed manpower:

I. Reduced productivity due to instability of work force

1. Excessive turnover
2. Excessive absenteeism

II. Reduced productivity due to ineffective labor management

1. Faulty selection and placement
2. Inadequate training
3. Lack of continuous upgrading

*at American Management Association's Personnel Conference, Chicago.

NOW *Speed-up* PRODUCTION WITH FAMCO PRESSES

The Famco Bench Type Arbor Press shown above is flaring insulation on armature cores of Dumore aviation motors . . . a typical example of how Famco Presses step up production and assembly operations in the nation's war plants. Famco's *exclusive* adjustable gib assures perfect ram alignment, eliminates "shimmy" and compensates for wear. Write for the facts about Famco's complete line of Arbor and Foot Presses. The Famco Machine Co., 1307 18th St. Racine, Wis.

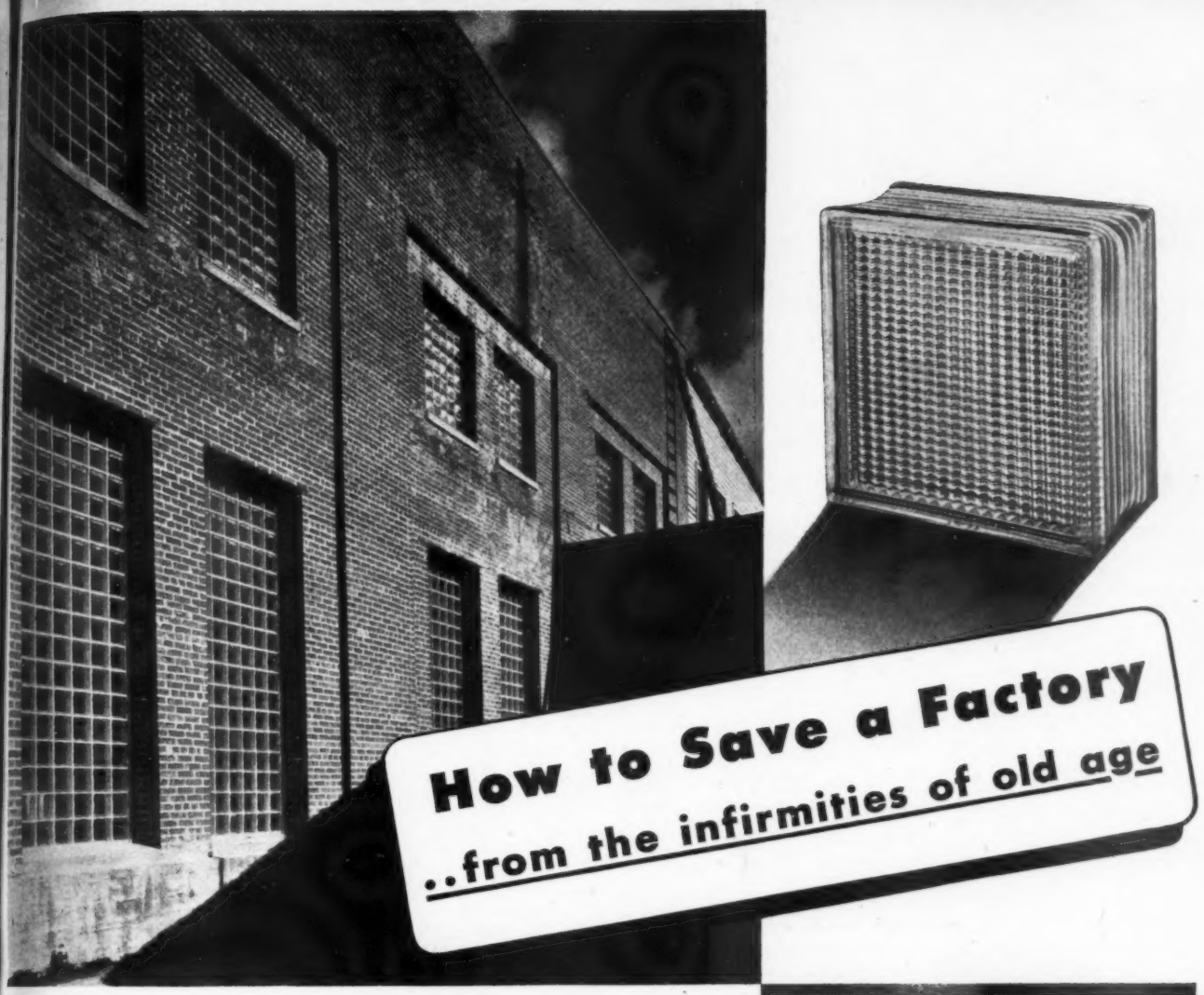
BENCH AND FLOOR MODEL ARBOR PRESSES

Famco builds *32 stock bench and floor model* Arbor Presses . . . plain lever type . . . simple ratchet type . . . combination compound and simple ratchet type. ½ to 15 tons pressure.

FAMCO FOOT PRESSES

Choose the right press for your job from *10 stock models and sizes* of Famco Foot Presses, built in floor types and for bench mounting.

famco
FOOT AND ARBOR
PRESSES



How to Save a Factory

..from the infirmities of old age

INSULUX Glass Block are replacing worn-out windows in thousands of America's industrial plants today to keep them operating efficiently and economically. Little or no critical material is needed.

Tests and actual installations prove that four-inch hollow glass block wall construction provides insulation that saves a substantial amount of *critical* fuel oil or coal as compared with ordinary sash.

Sturdy INSULUX panels keep out dust, dirt, moisture, and maintain privacy. They're fireproof—noncombustible. Special prismatic-type block diffuse and direct daylight to deep interiors where it is needed.

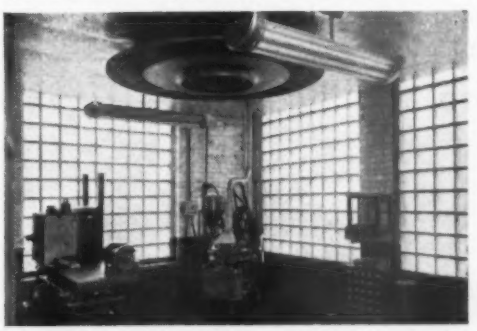
INSULUX Glass Block are available for *immediate delivery,* at economical pre-war prices. Write today for full details, and the name of the INSULUX distributor nearest you. INSULUX Products Division, Owens-Illinois Glass Company, Dept. 85, Toledo, Ohio.

OWENS-ILLINOIS

INSULUX

GLASS BLOCK

INSULUX panels simplify heating in this storage room of a large paper mill. Temperature is held even; humidity is controlled. Daylight is only illumination.



Every inch of floor space is usable in plants with INSULUX panels. Precision machines and delicate scale on wall next to light-transmitting areas are safe from outside dust, moisture, heat and cold.

Continental Superior

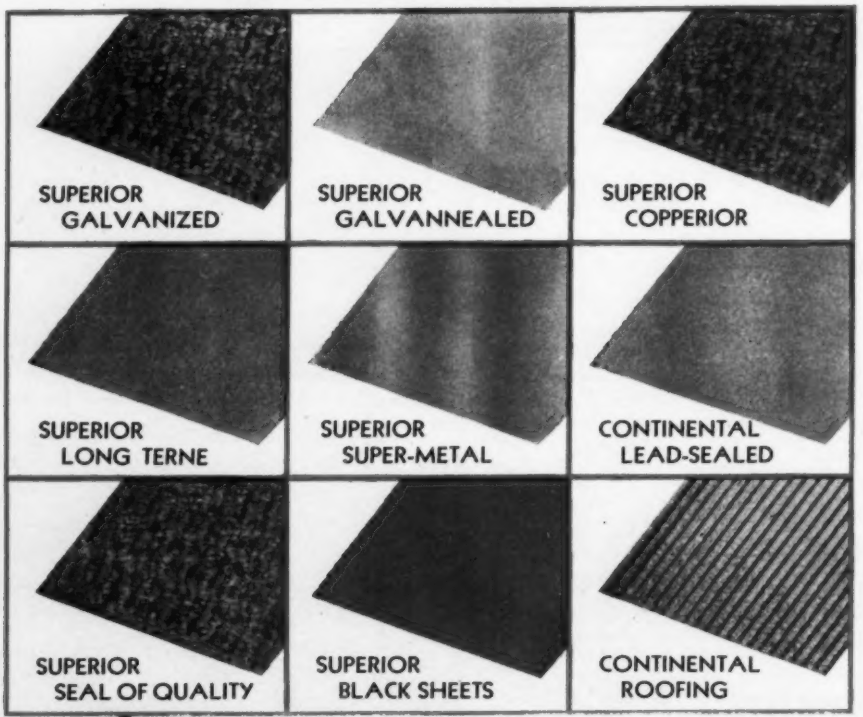
STEEL SHEETS

TO MEET THE WIDE NEEDS OF INDUSTRY

Modern industry has no place for "jack - of - all - trades" steel sheets. Nearly every steel sheet is a specialty, its properties designed for a definite class of duty. One application may require stiffness and weather resistance, another workability, still another, the ability to take and hold fine finishes.

To fill the wide needs of manufacturers, the Continental Steel Corporation produces sheets in a wide range of specifications and with over thirty different kinds of surface treatments, finishes and coatings. CONTINENTAL specializes in developing and producing steel sheets with definite qualities. After the war CONTINENTAL will be better equipped than ever to meet your needs and to work with you on your plans for new products. We invite your inquiries.

CONTINENTAL STEEL CORP., KOKOMO, IND.
The Superior Sheet Steel Co., Canton, Ohio—a Subsidiary



CONTINENTAL SUPERIOR STEEL

SUPERIOR

CONTINENTAL STEEL CORPORATION

to obtain highest individual potential

4. Ineffective supervision
5. Unduly short or long working schedules
6. Lack of adequate medical, sanitary, or safety program
7. Ineffective wage and salary administration
8. Lack of sustained cooperation with representatives of employed workers in development of effective labor-management policies
9. Lack of maintenance of two-way flow of information on company policies and developments to the employees, and ideas and suggestions for the improvement of productive techniques from the employees

III. Reduced productivity due to subjective factors affecting the individual employee

1. In-plant conditions

a. Reduced incentive due to sense of grievance as to wages, hours, individual status, or working conditions

b. Reduced incentive due to ignorance of importance of job and lack of sense of participation or recognition in war effort.

c. Mental fatigue due to noise, confusion, monotony, and boredom on job

d. Physiological impairment due to chronic ailments, bad eating arrangements, undue physical strain, bad air, bad light, or other physical conditions on job

e. Anxiety as to accident and health hazards on job

2. Out-of-plant conditions

a. Insufficient sleep and relaxation due to bad housing conditions

b. Malnutrition due to poorly planned and prepared meals

c. Excessive consumption of time and energy in transportation to and from the job

d. Lack of attractive, wholesome, and convenient recreational arrangements to avoid staleness.

e. Anxiety due to health and financial problems of employee or family

IV. Losses in manpower potential due to general plant conditions

1. Over-manning of departments or plant in terms of current needs of possible economies
2. Poor plant layout
3. Lack of balance between plant processes
4. Interruptions in flow of incoming materials and parts
5. Insufficient labor-saving equipment and tools
6. Unplanned suspension of work due to breakdowns, design changes, contract terminations, and stoppage of deliveries

NO PLACE FOR "Doubtful Screws"

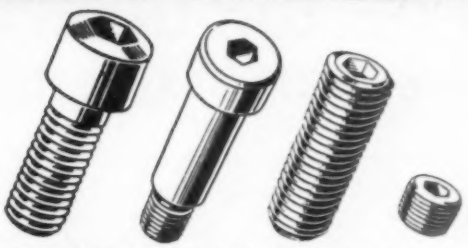
Photo by U. S. Army Signal Corps.

. . in the Mechanical "Brains" of our Fighting Forces . . .

With their own unaided senses, our fighting men could never win a modern war. Precision instruments are their mechanical "brains" . . . searchlights "see" the invisible enemy . . . sound locaters "hear" him hundreds of miles away.

Because it must withstand the gruelling strains of war service . . . because it must not fail in the field . . . this vital equipment can include no "doubtful" materials. The smallest detail must be as nearly perfect as human skill can devise. That is why Parker-Kalon Quality-Controlled Socket Screws are "on the preferred list" of many manufacturers of important war aids.

The unparalleled check-routine supervised by the Parker-Kalon Quality-Control laboratory eliminates the "doubtful screws" . . . screws that *look* all right but fail to *work* right. You can be *sure* of the physical and mechanical characteristics of P-K Socket Screws . . . yet they cost no more! Parker-Kalon Corporation, 196-200 Varick Street, New York, N. Y.



"Quality-Controlled means . . .

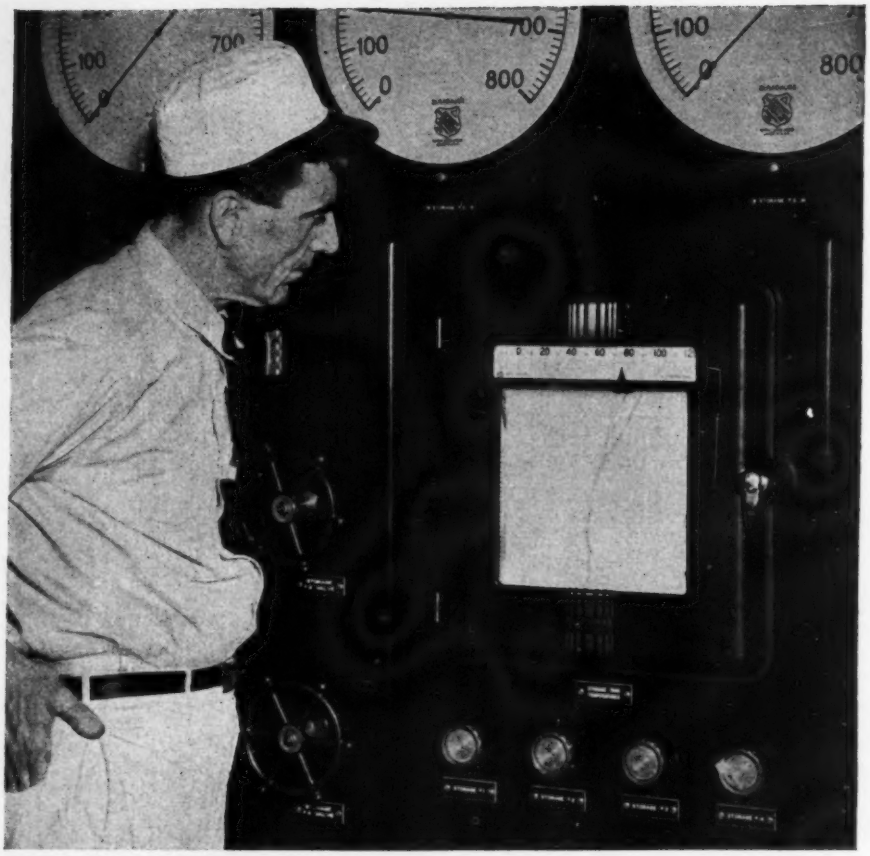
Complete test and inspection covering: Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, height and concentricity; Socket shape, size, depth, and centricality; and Thread fit.

PARKER-KALON

Quality-Controlled

SOCKET SCREWS

Give the Green Light to War Assemblies



Typical use of a Micromax Temperature Recorder is for gas temperatures in a Best Foods plant. This instrument is recording four temperatures, inside tanks 250 feet distant.

ON THE "LOW-TEMPERATURE" FRONT These Micromax Features Help Win

Here are some features which make Micromax Recorders highly accurate in process-industry plants:

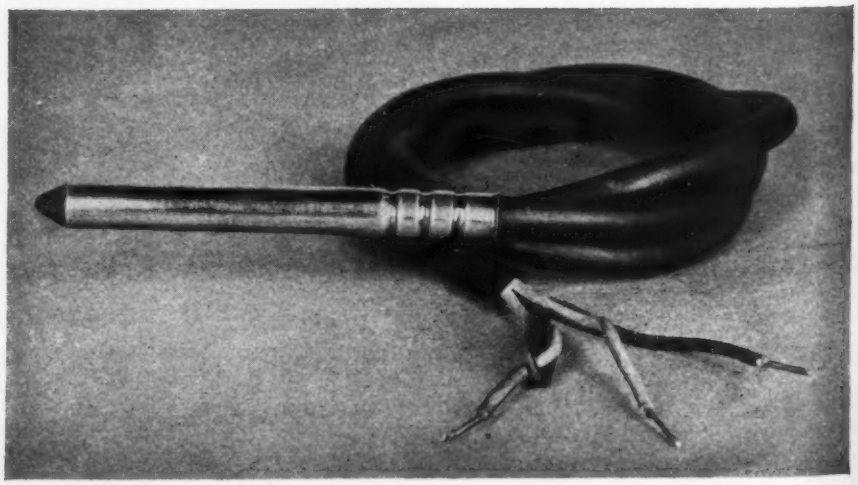
Operates At "Long" Distances. A Micromax may be many hundreds of feet from its Thermohm (electrical-resistance-thermometer bulb) and still be as accurate and sensitive as though both were in the same room.

Accidents, corrosion, etc., may, of course damage the Thermohm, but it can be replaced on the job, without affecting calibration of Micromax.

Motor-Driven. Taking its operating power from the plant's electric circuit, Micromax does not consume in its mechanism any of the thermal energy it measures. This not only increases accuracy but eliminates calibrated, jewelled bearings, constant-pressure springs and tubes, light, slender pen or pencil arms and delicate parts in general. Micromax sensitivity is that of a finely-fitted machine tool.

As Many as 16 Thermohms may be connected to one Strip-Chart Micromax, and their temperatures recorded in as many as 6 colors. The one-point or two-point Round-Chart Micromax can be read as far as its big dial can be seen.

Micro-responsive Control. The Micromax Recorder's trait of showing extremely tiny changes in temperature is readily extended to automatic control, either in modern on-off applications or by full-floating, proportioning control. In the latter case, the regulated valve may be electrically driven, or may be a penumatic diaphragm type. We will gladly help select the correct Recorder or Controller for a specific problem, or will send catalogs on request.



A Thermohm (electrical-resistance-thermometer bulb) for use with a Micromax Recorder. By an ingenious use of three leadwires instead of only two, the distance to the Recorder can be anything up to several hundred feet.

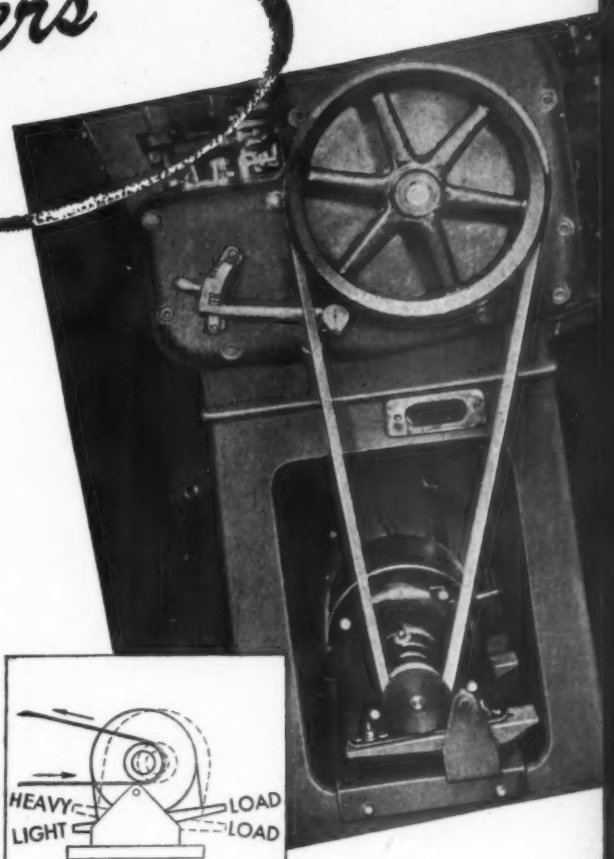
Jrl Ad N-33C(2)

LEEDS & NORTHRUP COMPANY, 4909 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

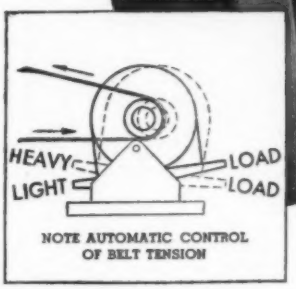
How one manufacturer eliminated "Belt-Eaters" and stepped up production 15%



In operating 50 candy cutting and wrapping machines, a well-known candy manufacturer faced several production and maintenance problems. Each of his machines had to be stopped ten times a day to be reloaded with wrapping paper. Since the starting load was 75% over normal load, belts and bearings wore out rapidly due to the high tension made necessary by the overload. Now he reports that by equipping all fifty machines with American Econ-o-matic Wedgbelt Drives, the trouble is eliminated. Belts take high starting load readily without slip. Belt take-ups have been entirely eliminated. Belt and bearing life increased. Production stepped up 15%. And maintenance costs are substantially cut.

Whether starting loads are light or heavy, improper belt tension results in many costly production and maintenance problems. When belts are too loose, you are losing R.P.M. and cutting down on the productive output of your machines. When tension is too tight, belts and bearings burn up, forcing shutdowns and interrupting production.

By changing over to an American Econ-o-matic Drive, you overcome these problems. You boost your machine output. You greatly increase belt and bearing life. The Econ-o-matic Drive is an American Short-Center Drive —either Flat-belt or V-belt—with an Econ-o-matic Motor Base that gives you *automatic* belt tension control. No more worry about belts too tight or too loose—no lost R.P.M.—no slippage—no unnecessary "time-outs" to make frequent manual adjustments—after you install American Econ-o-matic Drives.



NOTE AUTOMATIC CONTROL OF BELT TENSION

AMERICAN Econ-o-matic DRIVE

The load governs the belt tension. Here is the heart of the Econ-o-matic Drive . . . the American Econ-o-matic Motor Base. It *automatically* and *instantly* matches belt tension to each variation in the load on the motor. When the load is heavy, motor base pulls and tightens the belt. When the load is light, motor base slackens and loosens the belt. No slide rails or idlers to adjust. It's *automatic!*

Check these advantages of the AMERICAN Econ-o-matic DRIVE (Short-center Flat- or V-Belt Type)

- ★ *Longer life for belts and bearings*
- ★ *No belt slip—no lost R.P.M.*
- ★ *Maintenance man-hours greatly reduced*
- ★ *Smooth, cushioned starting*
- ★ *Increased machine output*
- ★ *Substantial power savings*

Navy "E" for excellence awarded February 12, 1942

Get This New Econ-o-matic Catalog

36 pages of helpful information that shows you how to solve drive maintenance problems—how this drive can help you increase machine output. This catalog provides you with complete information on American Econ-o-matic Drives, and shows how to select the right drive for your purpose. Send for your copy. Write now.

The American Pulley Company
PHILADELPHIA, PENNSYLVANIA

. . . Felters Wool Felt takes Oils, Greases, Heat in its Stride

Felters Wool Felt offers you the advantages of rubber but not its disadvantages . . . because felt, unlike rubber, is not affected by oils, greases, solvents, extreme heat, sunlight, or ozone. Felters Wool Felt also can be flame-proofed to make it fire-resistant.

Consider the use of Felters Felt, for its own versatile qualities, or as a substitute for rubber or cork, to insulate against cold, deaden sound, save weight. Felters Felt washers keep dirt and dust out of bearings, and yet retain the grease and oil to lubricate them properly.

Felters Felt is made to S. A. E. and Army and Navy specifications. Please call on us if our engineering and research departments can be of any service to you.

The Felters Company Inc.

210-A SOUTH STREET • BOSTON, MASSACHUSETTS

Offices: New York, Philadelphia, Chicago, Detroit • Sales Representatives: Dallas, Los Angeles, Nashville, St. Louis, St. Paul
Mills: Johnson City, New York; Millbury, Mass.; Jackson, Michigan

burned out motor

back on the job in 22 hours

BURNED-OUT MOTOR OF SPECIAL DESIGN RECEIVED 5:00 P. M. AT WESTINGHOUSE DISTRICT MANUFACTURING AND REPAIR PLANT. RE-PLACEMENT IMPOSSIBLE TO OBTAIN. MOTOR STRIPPED, REWOUND. STATOR DIPPED, BAKED, ASSEMBLED AND TESTED. DELIVERED TO USER FOLLOWING DAY, 3:00 P. M.—22 HOURS AFTER BREAKDOWN.

Westinghouse

DISTRICT MANUFACTURING AND REPAIR

J-90468

***IF* THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR**

EMERGENCY SERVICE

33 M & R PLANTS . . . ONE NEAR YOU!

GERMS ARE NATURAL-BORN HITCHHIKERS

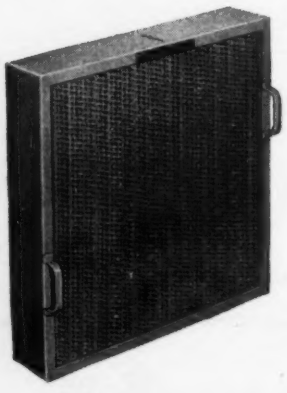
Germs don't have wings. Many of them seem to get around as passengers—on dust and other particles in the air. That's why clean air is such an important safeguard to health.

In many places this air-travel service for germs has been suspended. The vehicles on which they ride are "trapped"—and their pesky little passengers stop with them.

Air-Maze filters are widely used to provide clean, healthful air. Their wide range of advantages includes cleanability, maximum efficiency and low air resistance. Thousands of sizes and shapes are available.

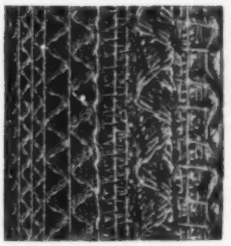
Air-Maze offers nearly 20 years of experience in working with air. We are now serving many important war industries, as well as the military services.

If your problem has to do with air, let our engineers work with you for a permanent solution. Write, without obligation.



This 20 x 20 x 4 filter contains more than three miles of crimped, viscous-coated, round-wire mesh. It is 99.83% efficient with practical dust. Its initial restriction is .10" H_2O, and its capacity well over 1,000 grams when "loaded."

AIR-MAZE Principle is More Effective 3 Ways



Air-Maze Filter Cross Section

HIGH EFFICIENCY is obtained by crimping round wire of graduated mesh. There are no dead or unbaffled areas.

LARGE CAPACITY results from the fact that every inch of wire is available for holding dust.

COMPLETE CLEANABILITY is assured by the crimp channels through which dirt is flushed out.

AIR-MAZE CORPORATION • CLEVELAND, OHIO

AIR-MAZE

SPECIALISTS IN AIR FILTRATION

Here are good examples of space-saving drives

The compact construction of the Philadelphia MotoReduceR

in both horizontal and vertical types, which combines the motor and speed reducing unit in a single streamlined housing provides great space saving advantages. These drives can therefore be located in many instances, in positions where other types of transmission equipment could not be fitted. However, compactness is only one of numerous superiorities found in the MotoReduceR. Their dependability, results in uninterrupted, trouble-free operation, so vital with today's all-out production schedules. Efficiencies are high (up to 97%) thereby getting maximum production from power consumed.

A wide range of horsepowers and reduction ratios meet most any need. Various motor enclosures. Our catalog M.R. 40 tells all about them. Send for a copy.

★ **A.G.M.A. STANDARD OUTPUT SPEEDS**

STANDARD OUTPUT SPEEDS for concentric and parallel shaft integral hp Gearmotors. Based on 1750, 1430 or 1165 rpm motor operating speeds.

1430	100	35
1170	125	30
930	125	16.5
780	100	13.5
640	84	11.0
530	68	9.0
430	55	7.5
350	45	6.0
280	37	5.0
230	30	4.0

AGMA

PHILADELPHIA GEAR WORKS

INDUSTRIAL GEARS
AND SPEED REDUCERS
TORQUE VALVE CONTROLS

ERIE AVENUE & G STREET
PHILADELPHIA, PA.
New York, Pittsburgh, Chicago

Philadelphia LIMITORQUE CONTROL operates all types of valves, etc., safely, economically, from convenient stations.

Philadelphia GEARS All types and sizes of industrial gears. Can be supplied in all materials.

Philadelphia WORM GEAR SPEED REDUCER right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

Philadelphia MOTOREDUCER The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

Philadelphia HERRINGBONE SPEED REDUCER for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

Faster Fueling

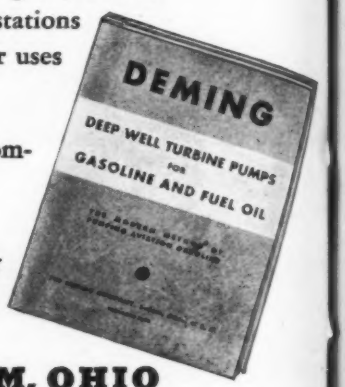
FOR TRUCKS, PLANES, AND INDUSTRY

the Deming Gasoline and Fuel Oil Pump

Successful performance in the rapid, dependable refueling of war planes and commercial planes is the forerunner of a wide demand for *Deming Gasoline and Fuel Oil Pumps* in other applications.

These turbine-type pumps incorporate features of design, construction, and operation which recommend them for fueling stations for trucks, tanks, and marine craft and for many other uses in refineries and industrial plants.

Deming Gasoline and Fuel Oil Pumps are shipped completely assembled and are easily installed.



A portfolio of information about these pumps including factual data on other types of Deming Industrial Pumps is available upon request.

THE DEMING COMPANY • SALEM, OHIO

DEMING *Industrial* PUMPS

DEEP WELL TURBINES • CONDENSATION RETURN UNITS • SIDE SUCTION CENTRIFUGALS • DOUBLE SUCTION CENTRIFUGALS • SELF PRIMING CENTRIFUGALS • TWO-STAGE CENTRIFUGALS • VERTICAL SUMP PUMPS • CELLAR DRAINERS • SHALLOW AND DEEP WELL PUMPS AND WATER SYSTEMS • JET PUMPS AND WATER SYSTEMS • "TURBO-FLO" PUMPS AND WATER SYSTEMS • TRIPLEX PUMPS • ROTARY PUMPS • PISTON PUMPS

We waited 4 Years to make this *Announcement*

★ ★ ★

EARLY IN 1938, Shell Scientists and engineers, after long tedious months of experimenting, were ready to give a new turbine oil its supreme test. Exhaustive laboratory analyses had shown it possessed properties previously thought unattainable by even the most optimistic turbine manufacturers.

But Shell men were not satisfied. "How will this new turbine oil stand up under actual operating conditions?" was the question they wanted answered.

There was but one way to find out . . . test it in turbines. They did. After a 2-year run, samples taken showed every characteristic of the original oil. Further checking was done . . . other tests were made. It still looked "as good as new."

Then, and only then, was the new Shell Turbo Oil announced. That was in January 1941. Even then many operators were doubtful that Shell Turbo Oil was as good as we claimed. "It hasn't been in use long enough," they said.

Today Shell Turbo Oil is able to show a performance record that should convince the most skeptical. For after more than 30,000 hours of operation in a power company's turbine, Shell Turbo Oil tests as well as the day it was put in over 4 years ago. To the original filling of 4,400 gallons only 300 gallons of make-up oil have been added. Certified chemical analyses of samples taken from the turbine show no signs of deterioration on any score.

30,000 hours of operation, in itself, is no record for a turbine oil. But 30,000 hours *without a single sign of structural breakdown* is a record in which every turbine operator should be interested. It is but one of scores of records being set by the new Shell Turbo Oil in all types of turbines.

Here is proof positive that the new Shell Turbo Oil has *the two most important* characteristics necessary to the proper lubrication of modern turbines:

SUPERIOR OXIDATION STABILITY
RUST PREVENTION

Ask the Shell man for the details today!

(Currently, the U. S. Navy has first call on Shell's entire production of marine turbine oil.)

Shell Turbo Oil

● We believe every good American wants above all to get this war won. Certainly that is the spirit here in the "Connecticut" plant. But postwar planning is as necessary to the business world as to government.

We do not believe tomorrow's world and yesterday's world have much in common.

We think that many of tomorrow's better things will come from "a little black box" containing automatic electric and electronic equipment. It will do much more than turn things on and off automatically at certain times — it will "look inside" materials being fabricated into finished products, "inspect" transportation equipment to be sure it is safe. It will improve communications amazingly.

This "little black box" is not the invention of "Connecticut" or any other one company. It merely represents the practical application of advanced electrical and electronic principles, many of which are being learned from wartime development. "Connecticut" development engineers will have much to offer the manufacturer who would like to see the magic of "a little black box" applied to his product, or to machines in his plant.

ARMY E NAVY

CONNECTICUT TELEPHONE & ELECTRIC DIVISION

GREAT AMERICAN INDUSTRIES INC.

MERIDEN, CONNECTICUT

THEY SAY AND DO

White-Collar Men Work the Split-Shift

White-collar men, working on a split-shift or half-shift system, are now easing the manpower situation for the Warner & Swasey Co., Cleveland. Splitting the 4:00 p.m. to 12:00 midnight shift into two equal parts, the plant takes on men, employed during the day in civilian pursuits, for a 4-hour night trick at war work.

Working six days a week, 155 of these two-man teams of salesmen, barbers, professors, pastors, engineers, attorneys, newspaper men, etc., do their bit. Placed on definite assignments, these men work by the side of an instructor to learn their new job. The department foreman and assistant foreman keep close check to see that each man is doing work for which he is suited.

According to Walter C. Mason, assistant employment manager, (1) 90 percent of the men are working because they want to help in the war effort, (2) the rate of absenteeism for this group is less than one-half of one percent, (3) the men are easy to train because of educational and business background.

With 10,000 such men working the split-shift six days a week, 240,000 man hours are created. This is the equivalent of 5000 men working a 48-hour shift a week.

•

Noise Abatement Fight Due to Continue

The national war on unnecessary noise will continue despite the great war that is raging among men.

In fact the National Noise Abatement Council has announced that it will concentrate its energies on service to the war effort. This announcement was made by its new president, Sam L. Hooper, as the Council prepares for the observance of National Noise Abatement Week, May 30 to June 5.

"Quiet Please—War Workers Resting" is the text of a poster which the Council created last year. Designed for display on the homes of night-shift war workers, the poster was widely distributed by the War Production Board which sent out 250,000 copies.

Industry is represented on the Council and in its activities. President Hooper, of Remington Rand, Inc., is assisted by George P. Little, of the Celotex Corporation, as vice-president; and W. L. Manning, of the Burgess Battery Company, as treasurer.

An example of the Council's work is shown by the program in which it has obtained the cooperation of the Michigan Council of Defense, Labor Advisory Committee, which will conduct a campaign to promote rest for war workers in 19 Michigan cities having a population of 20,000 or more.

"Lack of rest impairs the efficiency of night workers," the committee declared, "causing industrial accidents, absence from work, and loss of production."

•

Manpower Utilization Theme of AMA Conference

Manpower, how best to utilize it, and how to take advantage of the help the government is giving in providing workers where they are needed, was the keynote of the conference of the Personnel Division, American Management Association, which met in Chicago, on February 10-12, with about 2000 attending.

An 11-point memorandum outlining the policies for War Manpower Commission personnel, and recently issued by the executive staff of the War Manpower Commission, was reviewed by Lawrence A. Appley, executive director of the War Manpower Commission and vice-president of the Vick Chemical Company.

He outlined eleven basic concepts:

1. *What has been done, has been done* and, under the circumstances of the moment, done well. If we accept that as a fact, then there is no reason or time for lengthy explanations, apologies, and alibis. Neither is there any reason to consider changes or new suggestions that take place from now on as criticism of or reflection upon actions of the past.

2. *The time has come for action.* There has been plenty of research and planning upon which to base decisions now. Attention should go to the detailed and careful research and to the splendid recommendations that have gone into desk drawers without action or decision.

3. *Activity is of value only in terms of attainment.* More purposeful work and less mad activity is essential in this wartime for full utilization of human skills, efforts, and knowledge. If an organization works on this concept, employees will not be in doubt as to the importance of what they are doing or to its contribution to the war effort.

4. *All activity must be related to a program.* There must be a program for each bureau, division, section, unit, and individual. All must be related to contribute to the whole without conflict or cross purpose. Such a program must indicate what is to be done in terms of specific results, where, and at what time. It must indicate further how we intend to accomplish the program in terms of policy, organization, and action.

5. *Essential responsibility and authority must be delegated clearly and decisively.* The non-essential is to be eliminated.

6. *Decisions must be made on action to be taken without waiting to spell out*

Why Buy HALLOWELL WORK BENCHES?

1 YOU GET WHAT YOU WANT

Over 1367 "Hallowell" ready-made bench combinations to fit practically any need.

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Unlike when building your own benches, there's no hit-or-miss estimating of cost.

3 YOU CAN GET THEM QUICKLY

because deliveries of "Hallowell" Equipment are better than average.

4 THEY ARE A GOOD INVESTMENT

Well built for long usage. Constructed for easy movability.

Fig. 928.
Pat'd and Pats. pending. Drawer is extra.

Fig. 1927

FOR WARTIME SEATING
"HALLOWELL" WOOD STOOLS

Strong, comfortable, economical. Selected wood, firmly glued. Sizes 18", 21" and 24" with one set of rungs; 27" and 30" with two sets. Furnished with or without backrests having 3" vertical adjustments. Send for bulletin.

Write for literature on either of these products.

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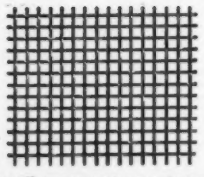


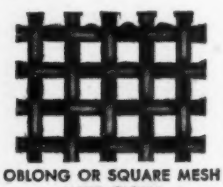
"JERSEY" INSECT SCREEN CLOTH

. . . and wherever wire screen has a war-job to do!

AGAINST the deadly insect-borne diseases that lurk in tropical Panama, China and the South Seas . . . the U.S.A. is doing a tremendous job of inoculation and insect eradication. But to make doubly sure, Army and Navy buildings are guarded by fine-meshed Roebling Screen . . . woven armor against disease and death. And it's just one of hundreds of ways woven wire is protecting machines as well as men in the Fight for Freedom.

Purging impurities from gasoline or fruit juices . . . screening powdered foods or cement . . . grading coal or ore . . . reinforcing rubber and plastic. You, too, can get wire screens that save time in vital production for victory when you let Roebling meet your wartime needs . . . as we did those of peacetime, and will again.

Coarse screen? Roebling makes 'em up to 6" openings of 1" rod stock! Fine? Roebling furnishes 'em down to 325 mesh, of .001" wire! Steel . . . iron . . . monel? Copper . . . brass . . . aluminum . . . stainless steel? Roebling supplies them all, and makes them promptly available to manufacturers of essential products.



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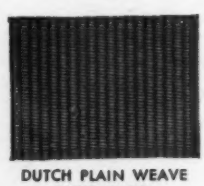
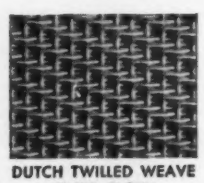


DUTCH PLAIN WEAVE FILTER CLOTH



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JOHN A. ROEBLING'S SONS COMPANY
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WOVEN WIRE SCREENS JAR ROEBLING

all the details and cross all the bridges. The war will not wait long enough for us to be sure we are right. Mistakes will be made. Mistakes can be corrected without criticism if progress is being made.

7. *Consideration cannot be given to individual prestige or jurisdictional disputes.* The job must be done by those who are in the best position to do it in terms of facilities, personnel, and other factors that exist regardless of where they may be. The responsibility of the War Manpower Commission is to get the job done and not necessarily to do it.

8. *The basic difference between staff and line organization must be recognized.* Line and staff form policy together. Activities and positions of each must be identified and function accordingly.

9. *The field organization gets the job done and must do so at the lowest possible level.* Headquarters must supply the field with the tools, ammunition, and assistance it needs. That means that the field organization must not be so loaded down with what it has to do for headquarters that it cannot do the job it is out in the field to do.

10. *The intelligence and abilities of everyone in the organization must be utilized to the fullest extent.* There is no person who is good enough to do any job in this war effort without help from others. Any organization involved in as gigantic a task as helping to win this war needs help and assistance from every employee in the organization.

11. *Bureau directors, service and division chiefs, section and unit heads must conduct regular staff conferences for the examination of the observance of these basic concepts within their own operations and for the appraisal of accomplishments in terms of them.* There are other constructive reasons for staff conferences but this particular demand for them is to assure that these ten above concepts become activated and dynamic throughout the organization rather than just highsounding phrases in some official document. Such concepts will never become a part of executive and supervisory thinking sufficiently enough to be reflected in action by mere issuance of a memorandum. There must be careful and continuous follow-up.

USES Asks for Cooperation

If the United States Employment Service is to be effective in assisting the War Manpower Commission with its labor supply, major employers of manpower have got to help, according to Glenn E. Brockway, assistant director of the Bureau of Placement, War Manpower Commission.

"The Service's staff and total organization must be strengthened and augmented by capable personnel and employment people who know how to recruit, classify, test, and select commercial and industrial employees," he declared.

Directing attention to the ways in which management could work with the U. S. Employment Service, he stated that the immediate and practical solution is sharing of experienced staff of industry

BIG HAUL
FOR UNCLE SAM

Selectively cut under scientific woods management, this forest harvest goes to war — leaving the vigorous younger growth for continuous harvests to come. Harvesting matured trees accelerates healthy forest growth.

Out of the Woods Come Planes and Plants

Roof Trusses by Timber Structures, Inc., Portland, Ore.

This 8-acre, all-timber plant of the Beech Aircraft Corporation was prefabricated, shipped, and erected in 60 days to make plywood trainer planes for the Army. It is but one of thousands of heavy-duty war structures engineered in timber under the TECO Ring Connector System. You, also, can now use the TECO System for Speed, Strength and Economy. *Write for our literature today.*

The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.

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More Tons per Hour

WITH AN I. B. BUCKET

Properly designed—as a result of over 50 years experience—Industrial Brownhoist buckets are light in weight yet of extra sturdy construction. Large sheaves reduce rope wear and maintenance to a minimum. Deep clean bites practically eliminate hand shoveling. Standard types (rope-reeve, power-wheel, link-type) in stock for immediate delivery. Write for complete information.

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Lowering Costs on Every Job

Simplex No. 22 10-Tons Capacity, 12½" Lift. Height Closed, 21¼". Toe lift 2¼" from ground level.

It lifts and lowers fast and more safely — reduces man-hours by increasing man-power. One of over 200 Simplex Jacks. Stocked by leading supply houses everywhere.

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Better, Safer Jacks Since 1899

Simplex LEVER - SCREW - HYDRAULIC Jacks

Make Your Jacks Last Longer!

Proper lubrication, care and handling will do it. Send today for a bulletin on the care of jacks.

and commerce with government in local offices where labor supply management must be carried out. He urged that management transfer certain of its normal employment office functions, and staff performing these functions, from the plant or business location to the Commission's local employment office facility, and that personnel and employment policies of management be clearly outlined.

He further asked that employers engaged in essential activities (essential war activities; any activity required for the maintenance of essential war activities; any activity essential to the maintenance of the national safety, health, or interest), and who benefit to the extent possible by "priorities in service," work with the United States Employment Service in the following ways:

1. Give the Service accurate labor market information. Give careful attention to the details that make up the Service's "Report of Current and Anticipated Employment." It is the basic source of information on labor market demand, locally and nationally.

2. Fully employ local labor supply before resorting to employment of outside or in-migrant labor.

3. When placing orders for workers, give the Service specific information concerning the exact job to be done.

4. See to it that non-occupational specifications are eliminated. Full utilization of our labor supply includes women, negroes and minority groups, aliens, and physically handicapped.

5. Give realistic orders in terms of numbers of workers required.

6. Command the Service to get to you services that you need and want, but which services it does not perform.

Absenteeism a Morale Problem

William H. Kushnick, War Department, discussed the necessity of morale in absenteeism in addressing the American Management Association. "The only solution to the problem of reducing voluntary absenteeism lies in establishing ways of stimulating the inclination to work," he declared.

Pointing out that absenteeism is only one aspect of the larger problem involving what the worker wants and expects, and that absence from work is a response to a total situation, he stressed the need for having a person perform the work for which he is best suited by temperament, aptitude, and intelligence; the need for desirable environment; the need on the part of the worker for a sense of well-being and of "belonging."

"The way we are inducted into a new position, the thoroughness with which we are taught our job, the way in which we are greeted by our boss, and praised or not at all; all these and other human relationships are acts of social recognition. On such things does morale rest, and morale is the most important element in reducing absenteeism. . . . Management must accept the principles that the worker is impelled by an inner urge to find an environment where he can take root, where he gets a sense of belonging, where he

HERE'S AMERICA'S NEWEST WEAPON IN THE BATTLE OF PRODUCTION!

NEW!

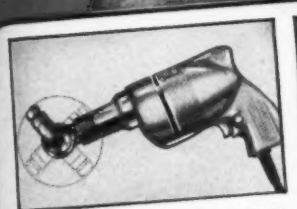
MODEL "47" SKILDRILL

HEAVY DUTY ¼ IN. DRILL FOR "ROUND-THE-CLOCK" PRODUCTION!

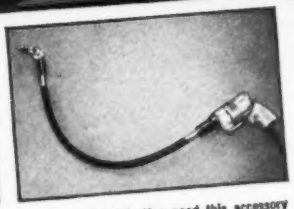
$36

★ GETS IN ANYWHERE A FIST WILL!

★ HANDLES LIKE POINTING A FINGER!



KETT UNIVERSAL APPLIANCE—You should have this unique appliance that extends the utility of SKILDRILLS . . . speeds up all tight-spot drilling in airplane wings, fuselages, etc. Swivels through 360° of angles in any plane. Light, easy to use. ¼ in. cap. chuck.



FLEXIBLE SHAFT—You need this accessory for fast, easy drilling in inaccessible spots. Drills at any angle. With SKILDRILLS in belt holsters, operator handles light shaft only; ideal for women workers. ¼ in. cap. chuck. Used with or without KETT UNIVERSAL.

Here is just the tool you need for fastest, most accurate ¼ in. drilling in constant 3-shift production. Like the famous Model "45" SKILDRILL (thousands now in use!) it's small, compact, light for easiest handling; but it has *even greater power* for your toughest jobs . . . *greater drilling speed under load* for more output per man!

Both in construction and design New Model "47" SKILDRILL has every feature you need. Compact die-cast body, helical-cut gears and 100% anti-friction bearing construction assure smoother, easier operation. Extra-Powerful Universal Motor provides peak drilling speed up to ¼ in. in steel, ½ in. in wood. Available in 4 speeds (1800, 2500, 3500 and 5000 R.P.M.) to fit every drilling need. Weighs only 3½ lbs.; only 7¼ in. long and 2 9/16 in. wide. Ask your distributor for a demonstration—once you see this tool in action you'll see why you need it now to boost production!

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HERE'S THE FAMOUS MODEL "45" SKILDRILL

The *preferred* drill in every field for easy handling and fast precision production drilling. Thousands in use even by women doing day-long drilling on assembly lines. Plenty of power and speed to keep pace with today's stepped-up schedules. $32.50

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Roll in the lunch, James

...WE'RE BUSY WINNING A WAR!

Every minute counts these days in the battle of production . . . and lunch-time bottlenecks can be a serious problem in busy war plants. PIX PORTABLE CANTEEN is one answer to this problem—designed to save steps, save time, save precious floor space. Keeps hot dishes, soups and coffee *piping hot*. Serves sandwiches, drinks, pastry and candy.

This is just one example of Pick Food Service Equipment that you will find in America's leading factories—planned by the men who'll gladly help you with your problem, be your budget large or small. Send for our new booklet No. CW 8 illustrating PIX PORTABLE CANTEENS.

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America's Leading Food Service Equipment House

IF IT'S FROM PIX IT'S RIGHT

FEEDING EQUIPMENT
** For War Industries **

sees the real purpose of his war work and feels important in doing it."

Supervision of Women

A report on the supervision of women industrial workers in the Republic Drill & Tool Company was made at the conference by Bert I. Beverly, M.D., medical and personnel director.

Believing that the highest quality of work is produced by those who enjoy the best possible physical and mental health, Republic tries to make factory life for women as livable as possible, coddling or no.

Working on the principle that women are biologically and physiologically different from men, specific jobs are set up for each group so that men and women never do the same kind of work. Machines for the women are specially designed for ease and comfort, and heavy work is cut to a minimum.

Never forgetting what women like, the company endeavors to make the plant clean. Clean washrooms, locker rooms, and showers, and attractive cafeterias keep up morale.

Rest periods every two hours, music throughout the plant, and recreational centers relieve the strain of monotony. A beauty salon, recently opened, caters even further to the women.

Close medical supervision and a safety department keep them physically well. Counsellors help the girls with problems in making adjustments inside the plant or at home.

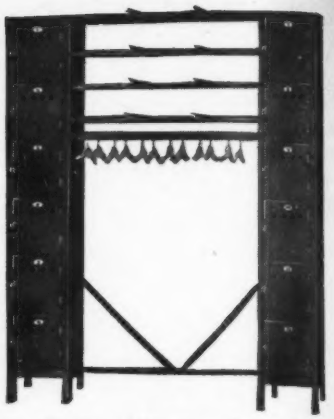
Wage Control Standard Urged

In viewing the wartime wage and salary control from the standpoint of management, Ray Warren, director of industrial and public relations, Ball Brothers Company, Muncie, Ind., and chairman of the labor committee, Glass Container Industry, pointed out that because the public does not fully understand the actual situation relative to the change in wage rates and because business does not understand what the government wants, confusion has resulted.

To alleviate the strain on industrial relations and the general frustration detrimental to morale, "we need to know what the War Labor Board and the Treasury Department have as a standard, relative to this description of terms of a wage or salary agreement, or wage or salary rate schedule," he stated.

"Management would like to see instructions, which so far have been expressed more or less in descriptive terms or stated principles, expounded into examples which could be utilized for individual comparison and guidance."

The great need of the moment, Warren continued, is for management to move quickly and efficiently in straightening out obviously routine matters concerning wages and salaries without increasing, or only slightly increasing, the cost. It will be necessary for management to intensify its efforts in developing the capacity and the ability of the individual. It means endeavoring to move individuals who are qualified into jobs of higher skill wherever and whenever



New "Wood" Locker Racks
Accommodate 12 in floor space of 5 ordinary lockers

The new hardboard and plywood Peterson Industrial Lockers come in both single and double (back-to-back) units that accommodate either *12* or *24* persons in every 5 running feet. Double locker room capacity and save valuable floor space for productive use. Provide each employee with a spaced coat hanger, an individualized ventilated hat shelf and a 12 in. x 12 in. x 12 in. lock box for lunch, micrometers, drawing instruments or personal effects. Keep wraps "in press" dry and sanitary—exposed to air and light. No crumpled hats or soggy lunches in stormy weather. Prompt delivery.

Write for circular.

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"The Checkroom People"
1841 N. Wolcott Ave. Chicago, U. S. A.

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DESIGNED INDIVIDUALLY TO FIT YOUR SPECIFIC PROBLEM

DECRIPTIVE FOLDER IS NOW AVAILABLE

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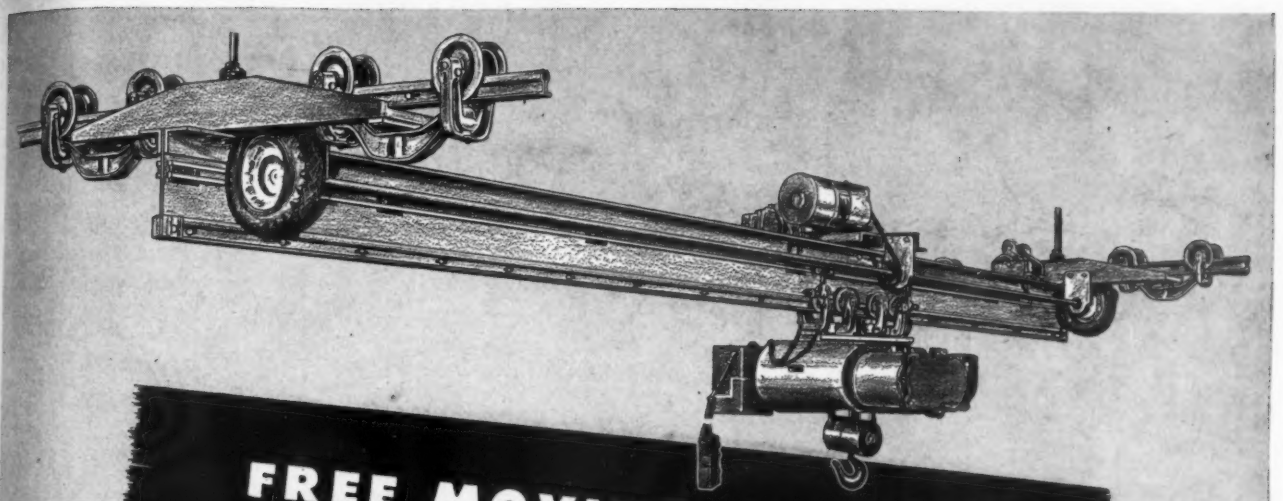
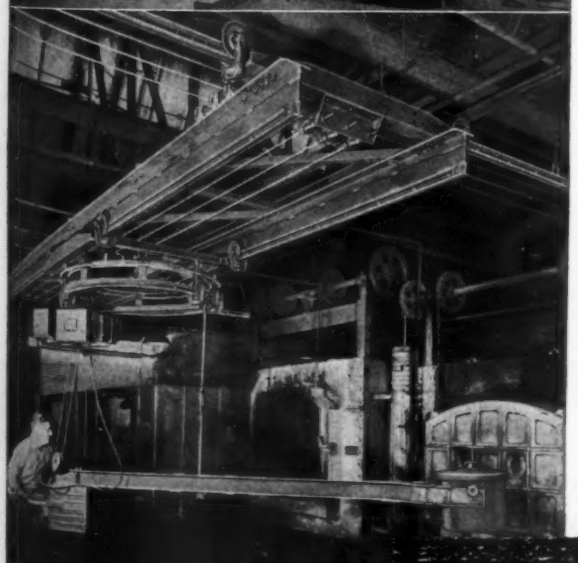


FREE MOVING CRANES AID WAR WORK



Flexible Design Permits later adaptability to regular production

Every American MonoRail System must be "made to order" and yet, these "tailor-made" systems are made from standard parts. Because of its extreme flexibility, American MonoRail offers a wide range of application without costly adjustment or lengthy engineering.

American MonoRail Cranes have proved to be invaluable in hundreds of installations. With the structural design greatly simplified, dead weight of the crane bridge is kept at the lowest point consistent with strength. This provides maximum live load capacity and requires less effort to move. Elimination of friction at all points by the scientific use of proper bearings make American MonoRail cranes the easiest of all to handle.

Let an American MonoRail Engineer consult with you.

WRITE FOR Blue Book illustrating hundreds of MonoRail installations.

Standard Crane Parts assembled into special unit at low cost to meet unusual production requirements.

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PROBLEM-SOLVERS
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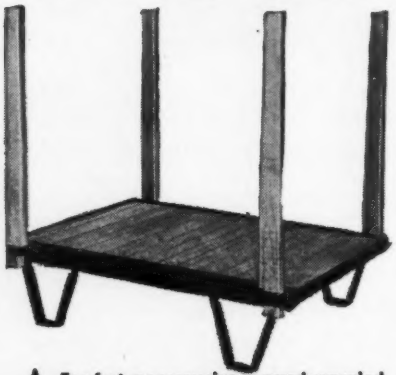
A COMPLETE LINE OF SKIDS, PLATFORMS AND FLOOR TRUCKS



★For fast maneuvering around crowded places, the "Ironbound" safety skid will step up efficiency and step down costs. Designed with rounded corners for greater operator safety thru elimination of leg wounds, these units are immediately available in standard types—specially built units on short notice. Illustrated literature sent on request.

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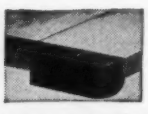
30 HOFFMAN PLACE HILLSIDE, N. J.

ROUND CORNERS prevent accidents to operators. Reduce damage to walls and machinery if bumped. Adds an extra protection to the material being moved.



ARMORED ENDS protect the end boards against jamming and splitting. Provide the utmost stability and give additional overall strength to the skid.

IRONBOUND SKIDS
AND MATERIALS-HANDLING EQUIPMENT

possible in order that compensation can be adjusted without raising the general cost.

"Industry rates must be maintained," he stated, "so long as price ceilings are maintained. Otherwise the resources of some companies would become exhausted in the competitive struggle in trying to pay the topmost rates."

•

Salvage and Maintenance Contest Winning Ideas

A second in a series of nationwide contests to discover the most outstanding methods of salvaging and maintaining machinery under wartime conditions, and open to users of metal spraying equipment, has just come to a close with $650 awarded in War Bonds.

First prize, a $250 bond, went to John Frisch, mechanical engineer, Price Bros. & Co., Ltd., Riverbend, Quebec, for his description of salvaging irreplacable 2000-lb. bearing journals with 28 pounds of sprayed steel.

A $150 bond, second prize, was awarded George E. Morgan, machine foreman, Pressed Steel Car Co., Inc., McKee Rocks, Pa., for his procedure in maintaining the packing area of a 3-ton hydraulic ram.

Bertram L. Bailie, plant engineer, Hiram Walker & Sons, Inc., Peoria, Ill., won the third prize of a $100 bond. He outlined a method for maintaining an accute fit on 6- and 8-in. plug cocks used in distillery valves.

The contest was sponsored by Metallizing Engineering Co., Inc., Long Island City, N. Y., and judged by Arthur M. Perrin, president of National Conveyors Co., Inc., N. Y.

•

Factory Management and Maintenance is a consolidation of *Factory and Industrial Management* and *Maintenance Engineering.*

Factory and Industrial Management grew from consolidations, mergers, or absorptions involving the following publications: *The Engineering Magazine; Industrial Management; Factory, the Magazine of Management; Management Engineering; Administration; Management and Administration; Management and Administration in Manufacturing Industries; Manufacturing Industries.*

Maintenance Engineering grew from consolidations, mergers, or absorptions involving the following publications: *Review of the Telephone and Telegraph; Electrical Review; Western Electrician; Electrocraft; Electrical Engineering; Electrical Review and Industrial Engineer; Industrial Engineer; Industrial Engineering; Industry Illustrated.*

In addition, features of the publication *Timely Ideas* have been added.

All rights in the above names are reserved by the publisher.

CALL YOUR DISTRIBUTOR

Mill Supply Distributors are specialists in keeping our war plants supplied with the necessary tools and equipment to help them in turning their wheels for All-Out Production.

They will always be ready to show you the advantages of Coffing Hoisting equipment.

Illustrated is Model AG "Safety-Pull" Ratchet Lever Hoist.

Write today for catalog G 6

COFFING HOIST CO.

Manufacturers of
Ratchet Lever, Spur Geared, Electric and Differential Hoists
Trolleys
Utility Maintenance Tools
DANVILLE, ILLINOIS

Installing Machinery in Your Plant?

SYNTRON

ELECTRIC HAMMERS

DRILL ANCHOR BOLT HOLES IN CONCRETE

Quickly—Easily—and Economically

Write for your copy of our new catalog.

SYNTRON CO. 480 Lexington Homer City, Pa.

Air Conditioning gives it OOMPH!

This war is being fought with *explosions*. All kinds...from block-busters to hand grenades. And don't forget the explosions in the barrels of guns that propel bullets and shells toward the enemy.

It takes a lot of skill to make a good explosion. Air conditioning helps.

The rate at which powder *dries* determines the way it explodes. It must not explode too soon or too late. Hence, special air conditioning . . . with temperature and humidity controlled precisely . . . is used for the drying of powder.

Also, air conditioning protects the lives of workers in munitions plants by providing the safest temperature and humidity conditions.

General Electric is an outstanding supplier of the new improved kind of air conditioning equipment needed for these wartime requirements. It has developed equipment more flexible, more compact than ever before . . . with more accurate temperature and humidity control.

Today this equipment is being devoted to winning the war. After the war, a far better air conditioning will be made available for offices and factories, stores and theatres; homes, hospitals and hotels . . . from General Electric.

Air Conditioning and Commercial Refrigeration Department, Division 433, General Electric Co., Bloomfield, N. J.

Air Conditioning by **GENERAL ELECTRIC**

1943

FIFTY YEARS

devoted exclusively to the design and manufacture of electrical equipment for circuit protection

★ SHAWMUT IS THE WORD FOR FUSES ★

The Chase-Shawmut Company
Newburyport, Massachusetts

1893

PC Glass Blocks
. . . a NECESSITY . . . not a LUXURY for plant rehabilitation

THE smart appearance of glass blocks is only a minor reason why they are so widely used by industry today.

Take the case of this Brooklyn textile plant. Previously a silk mill, it recently was converted to rayon production. For the rayon processes, high humidity was required and temperatures had to be controlled within close limits — conditions which could not uniformly be maintained with single-glazed windows. PC Glass Blocks were chosen to do the job because they provide insulation in the light-transmitting areas and will stay in trim, first-class shape under humidity conditions that would cause rapid deterioration of wood or steel sash.

Improved operating conditions have been experienced by many plants when PC Glass Blocks were installed. Besides providing insulation of daylighting areas, they improve daylighting by diffusing transmitted light. Special light-directing blocks furnish daylight to areas far from outside walls. Greater privacy is assured. Maintenance is reduced. Cleaning is simplified.

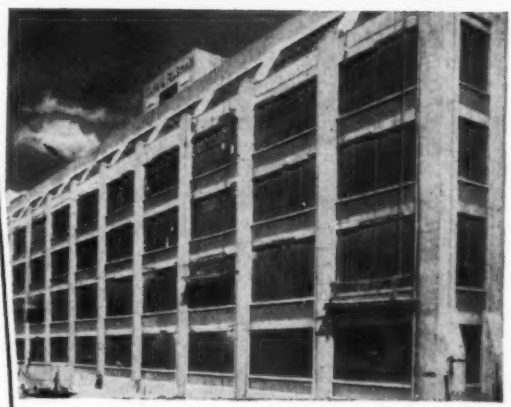
PC Glass Blocks are available for immediate shipment. They can be installed without the use of critical materials. They are a practical and timely answer to the problem of replacing worn-out sash. Get the facts about them now. Send for our free book that shows how they have been used successfully for plants in many fields of industry.

HOW TO REPLACE WORN-OUT SASH WITH PC GLASS BLOCKS

1. Take out the worn sash —scrap the metal.

2. Install new chases if necessary. Openings should be adjusted to allow for block sizes, mortar, and expansion joints.

3. Fill the openings with glass blocks. A regular mason can do this, using ordinary tools. Full details of this procedure will be furnished on request.



"PITTSBURGH" stands for Quality Glass

PITTSBURGH PC CORNING

GLASS BLOCKS

Distributed by

PITTSBURGH PLATE GLASS COMPANY

and by W. P. Fuller & Co. on the Pacific Coast

Pittsburgh Corning Corporation
2040-8 Grant Building, Pittsburgh, Pa.

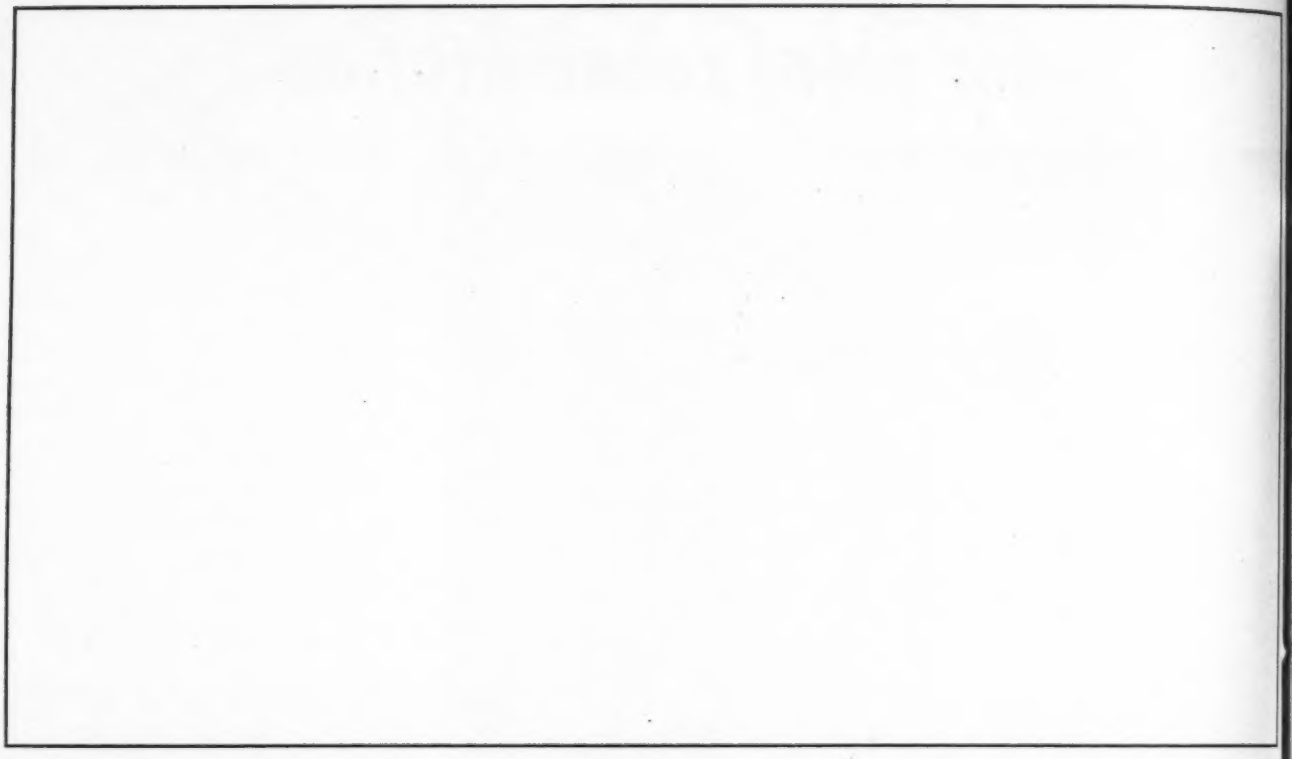
Please send me your free, illustrated book that tells how PC Glass Blocks have been used successfully in many industrial plants.

Name_____

Address_____

City_____ State_____

IS THIS A CLOSE-UP OF YOUR POSTWAR PLANS?



DON'T be discouraged if your postwar plans are a complete blank. The way to start planning is to start—right now! And Taylor Instruments can help you get started—without interfering in the slightest with the No. 1 job of winning the war!

We say this for just one reason—because Taylor Instruments are *built* for quick conversion to new processes. With their unit construction and interchangeability of parts, they can help you change almost overnight to whatever product you decide to make after the war.

And that's important, not only to you but to the whole country, because a quick conversion to peacetime production may be *our one real hope of postwar prosperity!* Many government and business leaders are agreed on this point.

We don't mean to imply that you can solve your whole postwar planning problem with a couple of Taylor Fulscope Controllers and a Taylor Aneroid Flowmeter! But we know Taylor Instruments can help—just as they are now helping thousands of plants take wartime production changes in their stride.

So when you make your postwar plans—keep Taylor Instruments in mind! Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada. *Instruments for indicating, recording, and controlling temperature, pressure, humidity, flow, and liquid level.*

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

★ KEEP ON BUYING U. S. WAR BONDS AND STAMPS ★

Save Copper and Steel with *Leather Belting* and Modern Group Drives

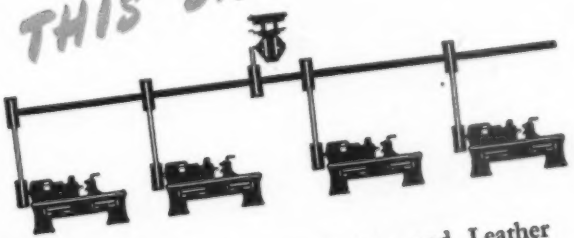
THIS WASTES!

In one typical case, four machine tools are individually driven by four 7½ hp. electric motors. These motors contain a total of approximately 112 pounds of war-vital copper in windings alone . . . and an estimated 122 pounds are used for controls and wiring. This means a total consumption of 234 pounds of copper. These four motors also contain about 745 pounds of steel that is urgently needed for guns, tanks and ships.

"The supply of copper is not adequate and never will be while this war is on," the Director of the WPB Copper Division recently stated. And the same is true of steel. Every means of preventing waste of these and other essential materials *must* be adopted by Industry!

Leather Belting, used in conjunction with Modern Group Drives, can save large quantities of these critical materials. Here are the facts . . .

THIS SAVES!



With Modern Group Drives and Leather Belting, these same four machines could be driven by *one* 20 hp. motor . . . using only 55 pounds of copper in windings and about 60 pounds for wiring and control, a total of 115 pounds. Compare this with the wasteful use of 234 pounds of copper in the individual drive set-up. *Here is a saving of 51% in copper alone!*

Furthermore, this 20 hp. motor contains only 370 pounds of steel . . . against 745 pounds in the four 7½ hp. motors . . . *a saving of 50%!*

This is typical of the economies that can be made in the average factory through the use of Modern Group Drives and Leather Belting, which usually reduces connected horsepower *anywhere from 25% to 45%.*

Other equally important wartime advantages of Leather Belting in Modern Group Drives include: saving manpower — lowering power consumption — increasing production — reducing shutdowns — cutting maintenance. For *complete* information on these efficient drives, get in touch with your regular Leather Belt supplier *now.*

Ask Your Belting Supplier for this Booklet . . . or write

AMERICAN LEATHER BELTING ASSN.
53 PARK ROW, NEW YORK, N. Y.

Rely on Leather Belting

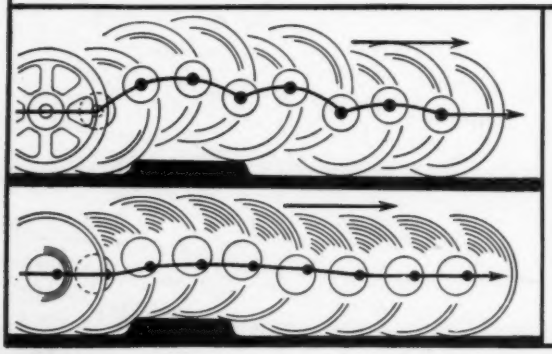
Now you can get a SMOOTHER RIDE Without Rubber Wheels

for.. FRAGILE MATERIALS
HIGH EXPLOSIVES
ELECTRICAL EQUIPMENT
DELICATE INSTRUMENTS
HIGHLY POLISHED PARTS

"Floating Hub" Construction keeps all wheels in contact with the floor, when even rubber tires will bounce the load. Note shock absorbing spring. The load is carried off center. As a result, the wheel rides the bumps without lifting and bouncing.

Here's the new **BASSICK "FLOATING HUB"** —the engineered Caster that will save Millions of Pounds of War-Essential Rubber — and yet do a Better Materials Handling Job.

BASSICK "FLOATING HUB" SMOOTHER THAN RUBBER!



THIS IRREGULAR LINE shows the bouncing action of even a rubber-tread wheel, when hitting a bump, indicated by line of travel of wheel hub.

THIS STRAIGHTER LINE shows the smooth travel-path of the floating hub, cushioning shocks and bumps.

If you have a problem in materials handling where rubber used to be considered essential, Bassick engineers are ready to consult with you without cost or obligation. Write us, addressing The Bassick Company, Bridgeport, Connecticut.

THE BASSICK COMPANY
BRIDGEPORT, CONN.
Division of the Stewart-Warner Corp., Chicago, Ill.
Canadian Factory: Stewart-Warner-Alemite Corporation of Canada, Ltd., Belleville, Ontario.

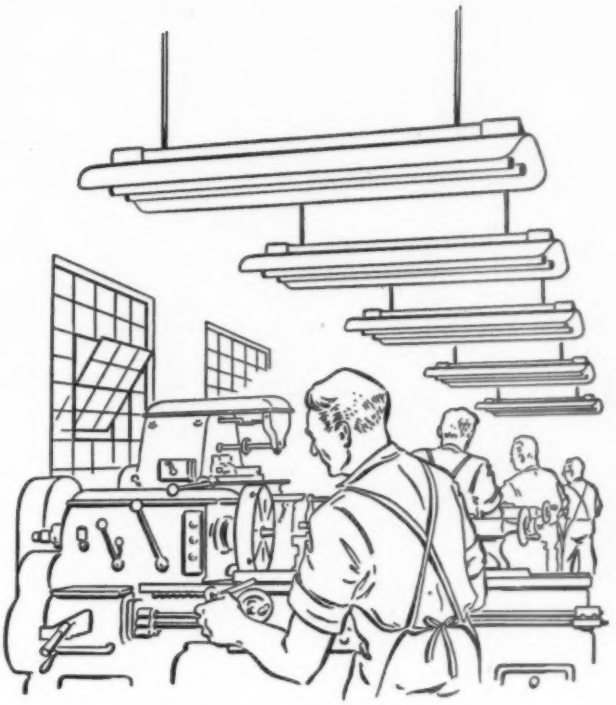
BASSICK "FLOATING HUBS" are now being developed for wheels on airport trailers, aircraft ground heaters, searchlight carriers, trailer truck casters and other war products.

Bassick FLOATING HUB Casters

• Never • Bounce • the • Load •

HERE'S HOW...

Westinghouse Lighting helps Small Plants convert faster

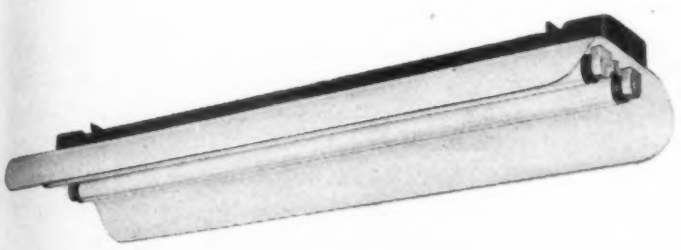


Today, many small plants are converting to war production. Such change-over usually requires better lighting—modern lighting—and in a hurry.

To help get your plant into war production faster, Westinghouse offers a complete lighting service. First, we are producing complete lines of lighting units—fluorescent, incandescent and high intensity mercury fixtures for specific industrial operations. Second, we offer experienced Conversion Lighting Counsel to help you obtain the lighting system you need.

For instance, you can choose from a complete line of fluorescent luminaires with nonmetallic reflectors for 40-watt, 100-watt and continuous strip installations. Whether it's for precision work or general illumination, we have the proper lighting for the job.

Providing the right lighting for industry is an all-out war job at Westinghouse today. And—117 Westinghouse Electric & Supply Company Offices and Independent Lighting Distributors will gladly help you with any conversion lighting problem. Or, write Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, Ohio. Plants in 25 Cities: Offices Everywhere.



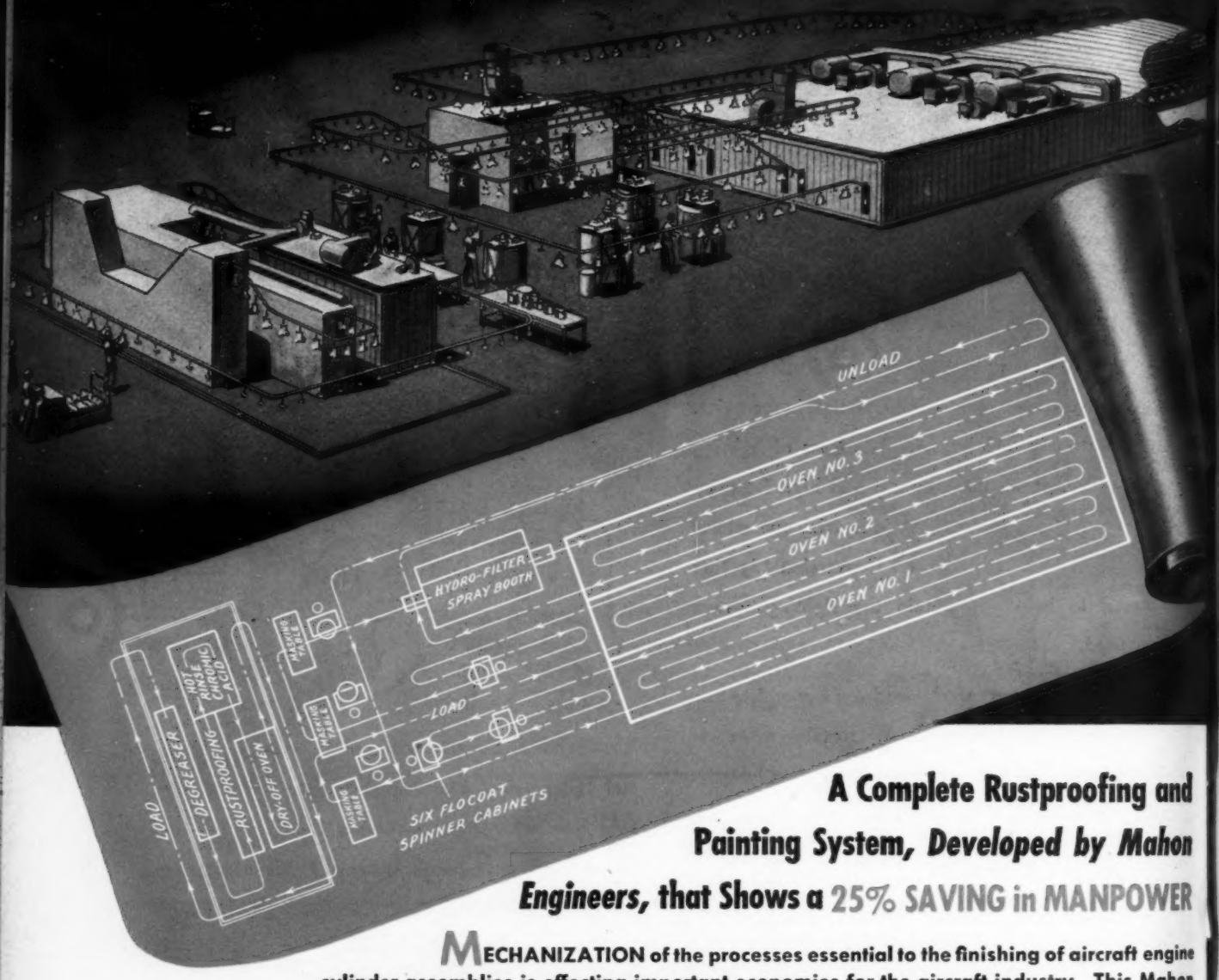
EXAMPLE

Westinghouse fluorescent luminaires are particularly adaptable for lighting workbenches, assembly operations, machine tools, inspection tables and for precision work of all kinds.

"Tune in the Westinghouse program, starring John Charles Thomas, Sundays, 2:30 P.M., EWT."

Westinghouse *Lighting Equipment*

Finishing System for Aircraft Engine Cylinder Assemblies



A Complete Rustproofing and Painting System, *Developed by Mahon Engineers*, that Shows a 25% SAVING in MANPOWER

MECHANIZATION of the processes essential to the finishing of aircraft engine cylinder assemblies is effecting important economies for the aircraft industry. This Mahon installation established a saving of 25% in manpower—35% in production cost.

Previously, much of the work was done by hand. Now—it moves in a steady flow by automatic overhead conveyor through degreaser, rustproofing tank and dry-off oven. From here it is transferred to masking tables and thence by conveyor again through 3 painting and baking processes (2 flo-coat and 1 spray painting). Each painting and baking process is a separate operation, yet so skillfully has arrangement and plan of travel been engineered, the flo-coat spinner-type cabinets, hydro-filter spray booth and the extensive 3-compartment baking oven occupy a relatively small floor area.

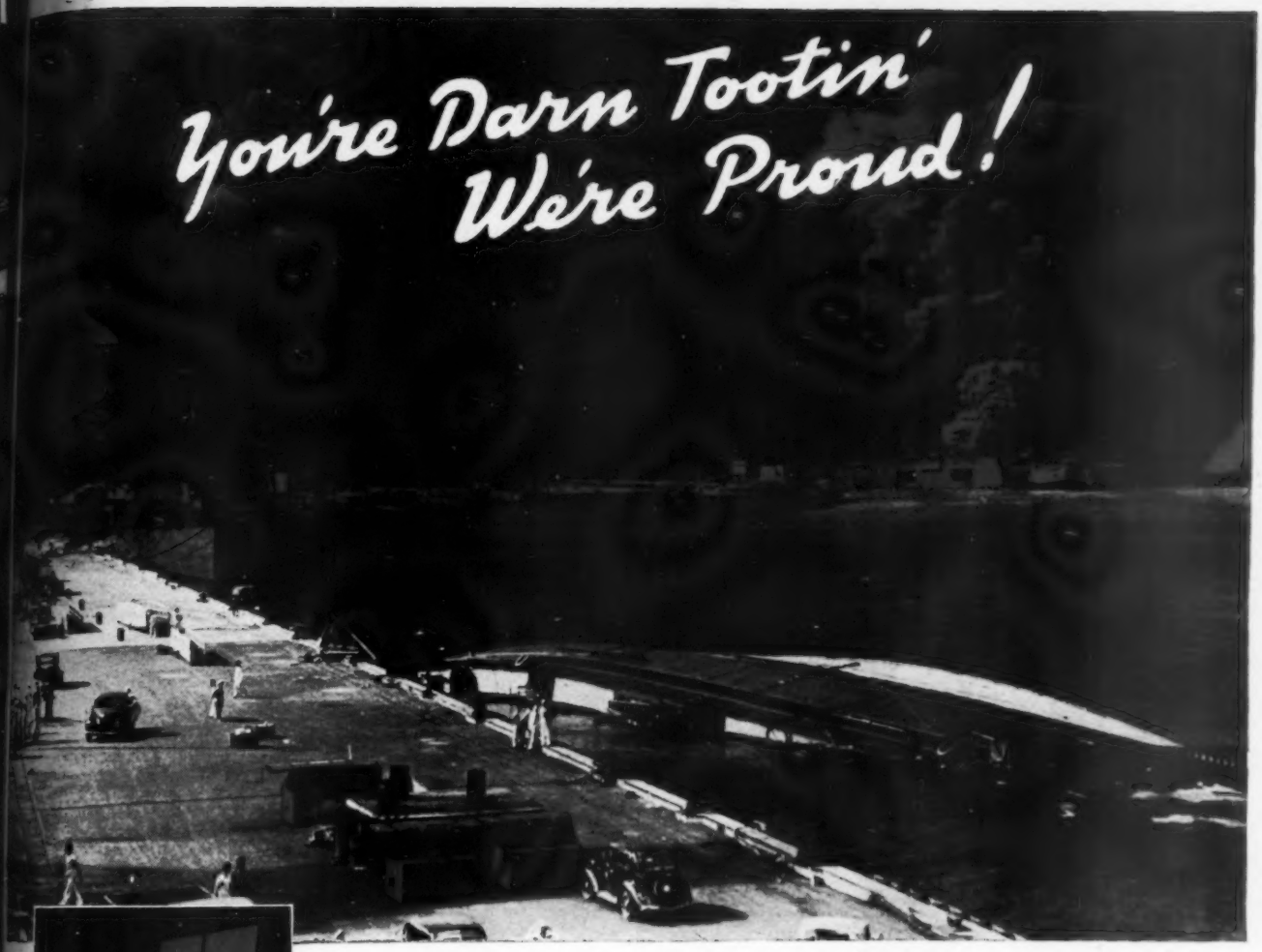
Other similar systems now are in operation—more are in the planning stage. They represent tangible examples of the savings in time, in money and manpower that Mahon engineering and equipment is accomplishing in the aircraft and other vital industries where finishing and processing operations are an important part of production.

These built-to-the-job Mahon Products are saving time, money and manpower in essential war industries. Metal Cleaning Machines, Rust-Proofing Machines, Hydro-Filter Spray Booths, Filtered Air Supply Systems, Ovens—including Drying, Baking, Core and Box Types, Hydro-Foam Dust Collectors, Complete Finishing Systems and Many Other Units of Special Processing Equipment.

THE R. C. MAHON COMPANY

DETROIT CHICAGO

You're Darn Tootin' We're Proud!



Official United States Navy Photo—General View of destruction following Jap sneak attack on Pearl Harbor. Note "DEMPSTER-DUMPSTER" bodies in foreground.

★ The thousands of red-blooded Americans who are putting everything they've got into building equipment to help speed up our march to victory are serving America . . . they have a right to be proud!

Little did we ever realize the vital part Dempster-Dumpsters were destined to play at Pearl Harbor, where, on December 7, 1941, a wreckage cleanup problem demanded action . . . speed. Fortunately, several Dempster-Dumpster hoisting units and a large number of Dumpster bodies of 6 cu. yd. capacity were on the spot . . . but for peace time service. They were pressed into war service immediately . . . bodies were rushed to most needed spots, and in an endless cycle, Dempster-Dumpster hoisting units placed empty bodies for hand loading of debris, hoisted loaded ones for hauling and automatic dumping and back again for more . . . never stopping for an idle moment.

No material handling equipment could have equaled the speed and vital service rendered by the Dempster-Dumpster during the days that followed that fateful December 7th.

You're darn tootin' we're proud of the job our equipment did at Pearl Harbor.

This truck, gas, tire, time, and man power saving system for handling materials is going on in hundreds of our nation's leading war and industrial plants. Dozens of different types of material handling jobs are being simplified and speeded up with various types of standard and special Dempster Bodies. Be it a dust, liquid, heavy or light material handling job, inside or out of your plant, the chances are that the Dempster-Dumpster system will give you 4 to 8 times the efficiency of any other material handling plan.

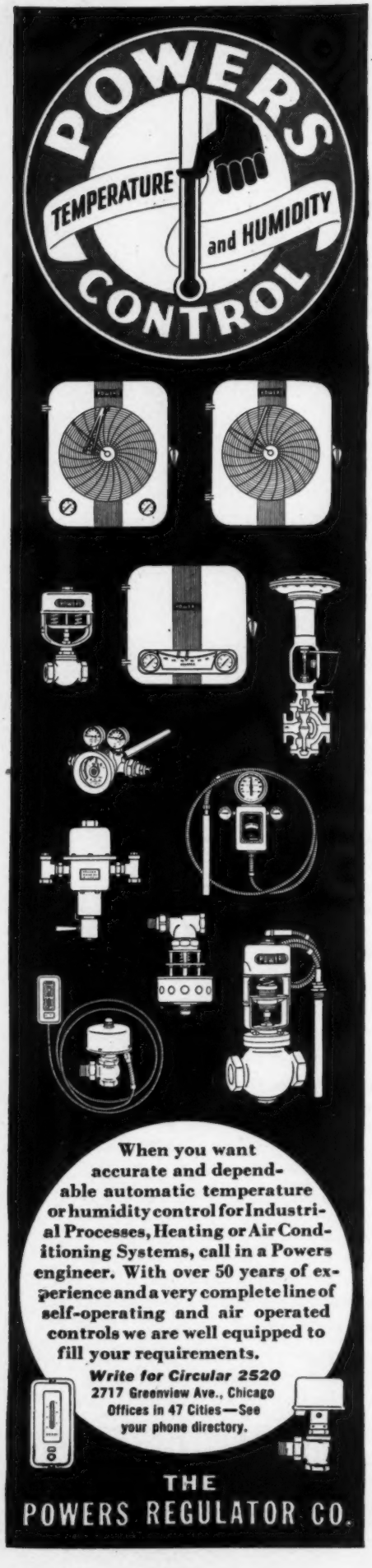
Write now for completely illustrated catalog showing many types of Dempster-Dumpster services.

★ ★ ★

In an endless cycle, Dumpster Truck Unit hauls and dumps one body while others are being loaded.

DEMPSTER DUMPSTER

DEMPSTER BROTHERS, Inc., 433 Springdale, Knoxville, Tenn.


POWERS
TEMPERATURE and HUMIDITY
CONTROL
When you want accurate and dependable automatic temperature or humidity control for Industrial Processes, Heating or Air Conditioning Systems, call in a Powers engineer. With over 50 years of experience and a very complete line of self-operating and air operated controls we are well equipped to fill your requirements.
Write for Circular 2520
2717 Greenview Ave., Chicago
Offices in 47 Cities—See your phone directory.
THE
POWERS REGULATOR CO.

FACTORY'S CATALOG SERVICE

Use the Coupon to Get Manufacturers' Literature

FACTORY, through the cooperation of leading manufacturers, makes it possible for you to secure catalogs, bulletins, and booklets listed here without cost or obligation. Check and fill out the coupon below and send it to FACTORY.

–1–

ABRASIVES–Shapes and sizes of mounted wheels and mounted points are listed in catalog. Prices given. Also shown is the utility set of 21 selected abrasive pieces. Bay State Abrasive Products Co.

–2–

AUTOMATIC CONTROLS – "Selecting Controls for Fuel Conservation" is title of 16-page manual intended to (1) explain in everyday terms as they apply to different types of firing rules for proper burning of fuel and (2) offer suggestions for the selection of equipment with which efficient use of fuel can be attained. Hotstream Heater Co.

–3–

BALL AND ROLLER BEARINGS–How to care for them and lubricate them is subject of Bulletin 1-43, which sets forth information useful to operating and maintenance engineers interested in securing the best possible operating performance and long life of antifriction bearings. Lubriplate Division of Fiske Bros. Refining Co.

–4–

BLOCK SANDER–"Mity-Midget" called the "smallest high speed non-stalling block sander" is introduced in a red, white, a blue folder. Sander is 5½ inches long, weig 3½ pounds. Features, price, and uses giv National Air Sander, Inc.

–5–

BLOWERS AND EXHAUSTERS–Bulleti I-100 describes centrifugal blowers and e hausters, positive displacement blowers, v uum pumps, and industrial vacuum cleani systems. List of users also included. All Billmyre Corp.

–6–

BONDING RING–To be used where there is a need for bonding between electri plug shell and wire shielding is explained leaflet. Types of electrical connectors a dealt with briefly in a condensed catalog s plement. Dimensions are given. Canno Electric Development Co.

–7–

BRUSHES–Two folders describe versatil of rotary and Tampico fiber power brush Among the wire bushing wheels listed are disk center wheel sections, Monitor steel w sections, Riehl steel wire sections, pict ringlock sections, and master wheel. Includ in the Tampico fiber brushes are the Fac sections, Monarch Tampico sections, a

MAILING COUPON—GOOD UNTIL MAY 31, 1943, ONLY

FACTORY MANAGEMENT & MAINTENANCE (March, 1943)
330 West 42nd Street, New York, N. Y.

Please have manufacturers send me, without obligation, literature below.

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35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
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Name ..... Title .....

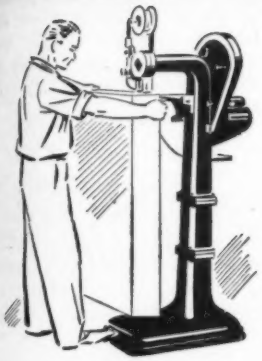
Company .....

Street Address .....

City ..... State .....

Please fill out this coupon completely in order to avoid delay in handling. (Numbers correspond to descriptive paragraph numbers.)

CARTON STITCHING DOUBLED



BY LOW-COST

Acme SilverStitchers

Many war product manufacturers have doubled their output of stitched cartons. Others are saving more than 30% in material and labor. Nor are these isolated cases—Acme Silverstitchers are helping in hundreds of war plants—making box stitching easier and faster for men and women operators—helping to keep the packing room in step with production—and incidentally cutting costs.

Mechanism is easily accessible.

SIMPLE IN DESIGN

Acme Silverstitchers are made in standard and several special sizes and types. Have few moving parts, are easy to operate—are sturdily built—and are low in cost. There is an Acme Silverstitcher to meet every stitching requirement.

ACME SILVERSTITCH FOR BETTER AND FASTER STITCHING

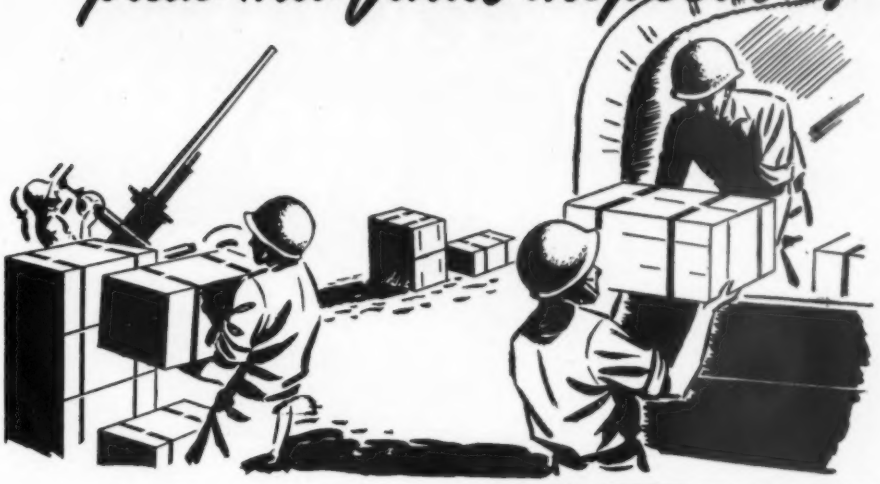
Acme Silverstitch Stapling Wire and Silverstitchers are built to function together . . . to assure stitching satisfaction year after year. Acme Silverstitch is true to size and temper . . . provides strong stitches . . . and is rust-resisting. Coils are furnished in 5- and 10-lb. sizes for all types of equipment. Mail the coupon for all the facts on faster and better carton stitching.

ACME STEEL COMPANY
2831 Archer Ave., Chicago, Ill.

ACME STEEL COMPANY
2831 Archer Avenue, Chicago, Illinois
☐ Send the complete folder with all the facts on faster, easier, lower cost stapling.

Name.....
Company.....
Address.....
City.....State.....

Will your war products pass this final inspection?



Over rail . . . across miles of enemy-patrolled water . . . through trail-less jungles . . . this shipment got there, because it was shipped right and strapped right. It passed the final inspection—safe arrival. Acme Steelstrap assures safe protection to every type of shipping pack . . . complies with all Federal Strapping Specifications.

DAMAGED SHIPMENTS HELP THE AXIS

American and Allied soldiers may be seriously handicapped—even placed in jeopardy—because the war product you're making doesn't arrive in perfect condition. Remember, no product becomes a real war product until it is safely in the hands of those who will use it.

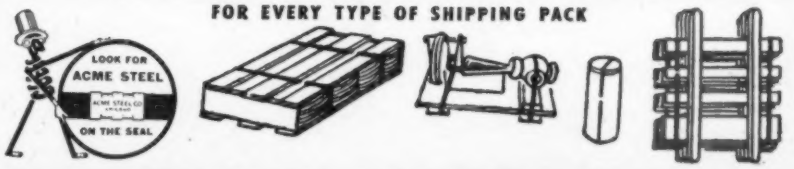
"BOUND TO GET THERE" WITH Acme Steelstrap

A product that is Acme Steelstrapped is assured of maximum protection. Besides, container material is conserved, handling speeded, costs cut . . . and shipping space reduced. There is a type of Acme Steelstrap for every type of war package. Send for free, helpful literature now.

Strapping is speedy and easy with Acme Steelstrappers which tension, seal and cut the strap with a single stroke of two levers. The tool is equipped with an automatic seal feed.

Cartons of metal parts are made "Bound to Get There" with Acme Steelstrap. The Acme Process keeps the packing room in step with production.

FOR EVERY TYPE OF SHIPPING PACK



ACME STEEL COMPANY
2831 Archer Ave., Chicago, Illinois

CAN IT BE MOVED FASTER?
YES! FASTER AND MORE EFFICIENTLY on an ALVEY-FERGUSON Conveyor
● To keep tote boxes moving to the annealing furnace not only at a *uniform* rate of *speed*—but at the *fastest* speed possible for efficient handling—A-F engineers produced this A-F *endless-stream* chain conveyor system.
Safer, more economical and far more efficient than the former method of handling tote boxes, this A-F Conveyor System has many other "plus features."
Whatever *your* "indoor transportation" problem, write, wire or phone and we will help you solve it! Or write today for our latest conveyor folder showing recent war plant installations.
The Alvey-Ferguson Co., Dept. F, Disney Street, Cincinnati, Ohio.
Alvey-Ferguson Produces All Types of Conveyors
CONVEYING A F MACHINERY

treated Tampico end brushes. The Osborn Mfg. Co.

–8–

BURNERS–Superheat burners, high-speed concentrated heat sources fueled with gas and air only, are introduced in 8-page, 2-color catalog. Jobs being done, application and control technique, construction details, and operating principles are discussed. Full capacity and selection data included. The Selas Co.

–9–

CARBIDE TOOL CARE–Red, white, and blue illustrated wall chart titled "4 Simple Ways to Get Longer Life from Your Cemented Carbide Tools" covers critical speed, clearance angles, sharpening, and tool position for best results from carbide tools. Vascoloy-Ramet Corp.

–10–

CARRIERS – Specialized industrial baskets, crates, trays, and fixtures are featured in 4-page folder. Fifteen widely varying types are illustrated. Rolock, Inc.

–11–

CHAINS–sprockets, and couplings are pictured and described in 64-page Catalog 642, which contains list prices and engineering information on the design and application of silent chain drives and flexible couplings. Ramsey Chain Co.

–12–

CIRCUIT BREAKERS–Booklet DD-29-060 gives data on the complete line of Nofuze De-ion circuit breakers available for panelboards, switch-boards, built-in applications, individual mountings, and separate inclosures. Special attachments are described. Westinghouse Electric & Mfg. Co.

–13–

CLEANERS–for washroom service and floor cleaning and sanitation products are reviewed in attractively illustrated catalog. Floor sealers and finishers and cleaning accessories also shown. Second part of the book is devoted to sanitation methods and materials. Vestal Chemical Laboratories, Inc.

–14–

CLEANERS–Liquid brush cleaner and how it is used is described in booklet "The Solution for the Paint Brush Problem." Leaflet tells about hand cleaner for removing dirt, grease, paint, and grime. Samuel Cabot, Inc.

–15–

CLEANING–Steam-detergent cleaning with solution-lifting guns is reviewed in 24-page manual. Numerous case histories on use of this cleaning method supplement the general data. Oakite Products, Inc.

–16–

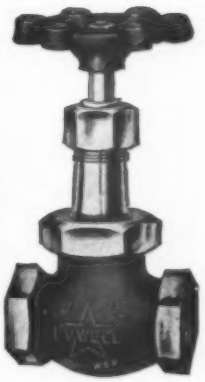
COMPRESSORS–Two types of rotary compressors, single and two-stage, are shown in 4-page folder. Photographs of actual instal-

POWELL VALVES ... *the answer to all flow control problems*

The history of the Powell Line is written in the amazing evolution of American Industry, because for nearly a century Powell has been meeting and satisfying every demand imposed by each new process or development in the industrial world.

Big valves, little valves . . . valves for high pressures, low pressures . . . for varying temperatures . . . for corrosion resistance. Globes, gates, checks, reliefs, non-returns, Ys, angles . . . in iron, steel, bronze, pure metals and special alloys—*Powell has them all.*

Shown here are a few examples of the many Powell Valves evolved by our Research Engineering Staff to meet some particular requirement. Having completely fulfilled it, they have taken their place in the Powell line.



Today, for every known demand, Powell has the answer. And, as new problems arise in the future, Powell Engineering will be ready and able to solve them. In either case Powell Quality costs no more in the beginning and saves in the long run.

The Wm. Powell Co.

Dependable Valves since 1846

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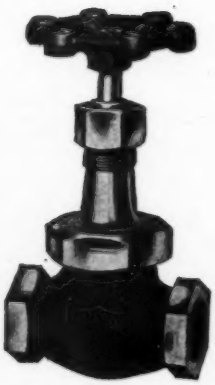
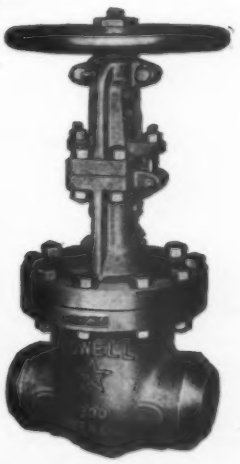
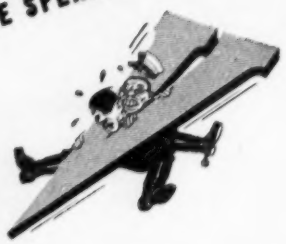




POWELL VALVES

Metal Shapes—
THE SPEARHEAD OF VICTORY



GIVE 'EM THE SQUEEZE

Now, the full weight of America's armament program puts the pressure on the Axis where it hurts and we review with satisfaction the part we've played . . . and are playing . . . in bringing this about.

Our job is to work with metals, shaping them into parts for industry's needs. Today, such parts help fight the war . . . tomorrow they'll build the peace.

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SPECIAL BOLTS, NUTS AND STUDS

DROP FORGING AND DIE SINKING

SCREW MACHINE PRODUCTS

HEAT TREATING

SPRAYED METAL SERVICE

Estimates gladly submitted. Send samples or blueprints. Catalog on request.

RHODE ISLAND TOOL COMPANY
148 West River St.
Providence, R.I.

Serving American Industry Since 1834

RITCO

lation appear on last page, description and features on pages 2 and 3. Fuller Co.

–17–

CONDUIT—Orangeburg fiber conduit and pipe are shown in 12-page, two-color booklet. Uses are specified, and pictures of actual installations emphasize the saving of critical materials and saving of installation costs. General properties are described, specifications listed. The Fibre Conduit Co.

–18–

CONVEYORS—Overhead and drag chain conveyors and dispatch tubes for expediting production are described in the pamphlet "Watch Production Zoom." Lamson Corp.

–19–

ELECTRIC EQUIPMENT—Midget metal base relays, features, and prices are given in Bulletin 104. Bulletin 23 shows the Vitrohm strip resistor and lists specifications. Ward Leonard Electric Co.

–20–

FILE FILOSOPHY—Gives tips to the tool user in selecting the right file and its correct use. Written in clear, simple language, this book is a brief account of the history, manufacture, variety, and uses of files in general. Nicholson File Co.

–21–

FILTER CLOTHS—of cotton, wool, woven glass, for handling all kinds of liquids are described in small 4-page bulletin. Samples of the different kinds of cloths are shown. Applications are listed. William W. Stanley Co., Inc.

–22–

FIRE PROTECTION SYSTEMS—"Water-Fog"—what it is and how it works—explained in leaflet. Illustrations show how Fog, a dense mist-like spray of water, envelops and smothers flames. Complete WaterFog systems, applicators, and nozzles shown. Rockwood Sprinkler Co.

–23–

FITTINGS—Wall chart illustrates tube, universal, hose, and pipe fittings in column form. Lists "AN" specifications. Catalog J-103-J gives a complete line, numerically indexed, of industrial parts. Weatherhead Co.

–24–

FLOOR MAINTENANCE—"The Hild System of Industrial Floor Maintenance" tells what clean floors mean to employees in the way of safety and morale, and shows best devices for dispatching dirt. Hild Floor Machine Co.

–25–

FLUSH VALVE—for wartime projects is the subject of bulletin No. 858-W. A convenient table shows the proper flush valve combinations to use to comply with various item

DAYTON SAFETY LADDERS
have every advantage

No extra man needed to steady—Roomy platform for men and tools—Great strength, lightweight. Guard rails on platform—Automatic locking—Folds compactly. Airplane spruce used throughout—Steel braces—Safety shoes. Available in sizes 3' to 16' in height—Elevating platform adds height to the Dayton Safety Ladder. *Write today for Free Catalog—Prices.*

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Paint Spray + Dusts + Fumes +

STOP the "AIR-RAID" on wartime production

★ Don't let dangerous dusts or paint spray interfere with defense production. Give your workers these Cesco Masks. Keep skilled help ON THE JOB and KEEP PRODUCTION MOVING.

This new Respirator FITS high on the nose. Does not interfere with wearing of goggles. Approved (No. BM-2142) by U. S. Bureau of Mines for PROTECTION against Type A (Silica), Lead and Nuisance Dusts. Write for circular.

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Finish your defense products BETTER and much FASTER. Equip your paint sprayers with this wide-vision mask. Hood attached to cap fits snugly over shoulders. Made in light muslin, rubberized cloth or heavy khaki.

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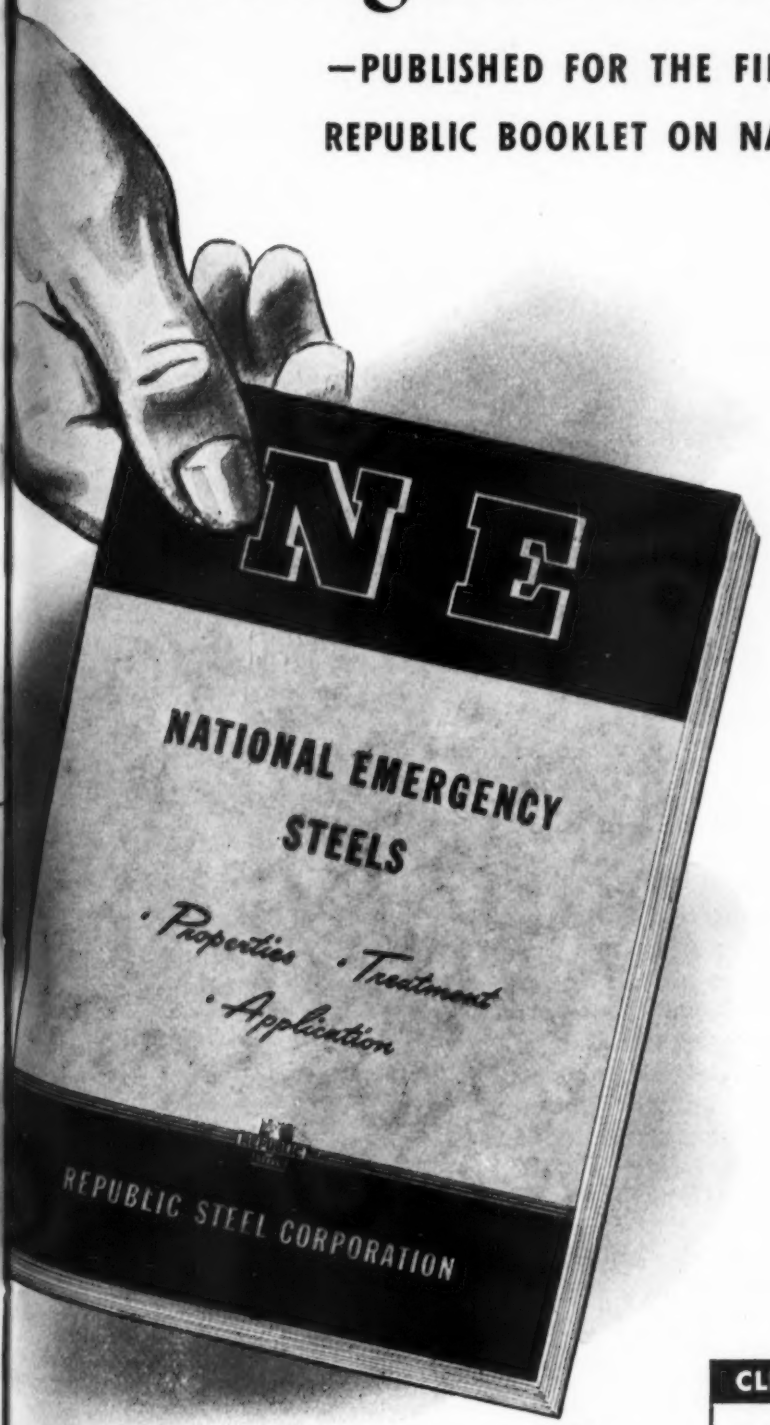
New, Original Data on NE Steels

—PUBLISHED FOR THE FIRST TIME IN THIS HELPFUL REPUBLIC BOOKLET ON NATIONAL EMERGENCY STEELS



Here's just what you've been looking for—70 pages of valuable *new* data on the properties, treatment and application of the NE Steels—in handy, usable book form.

Much of the material in this book—charts, tables and specifications—has been prepared from original research conducted by Republic metallurgists. There's an explanation of the end quench hardenability test and its importance, too.

Republic—long a leader in alloy steel production—was an important factor in the development of the NE series. Now, Republic offers this helpful book on NE Steels as its contribution to more efficient, more productive, faster war fabrication wherever these alloy-conserving steels are applied.

If you have been using alloy steels, you probably are now using NE Steels—or will in the near future. You should have a copy of this book at your finger tips. You'll be surprised at the vast amount of data it will bring you. Printing is now under way, and the book will soon be ready for distribution to *engineers, metallurgists and production executives.* Send your request now to insure early delivery.

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Republic Steel Corporation, Department FM
3100 East 45th Street, Cleveland, Ohio.

Please send me a copy of your new NE Steels Handbook, which I understand will be off the press shortly.

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Company _____

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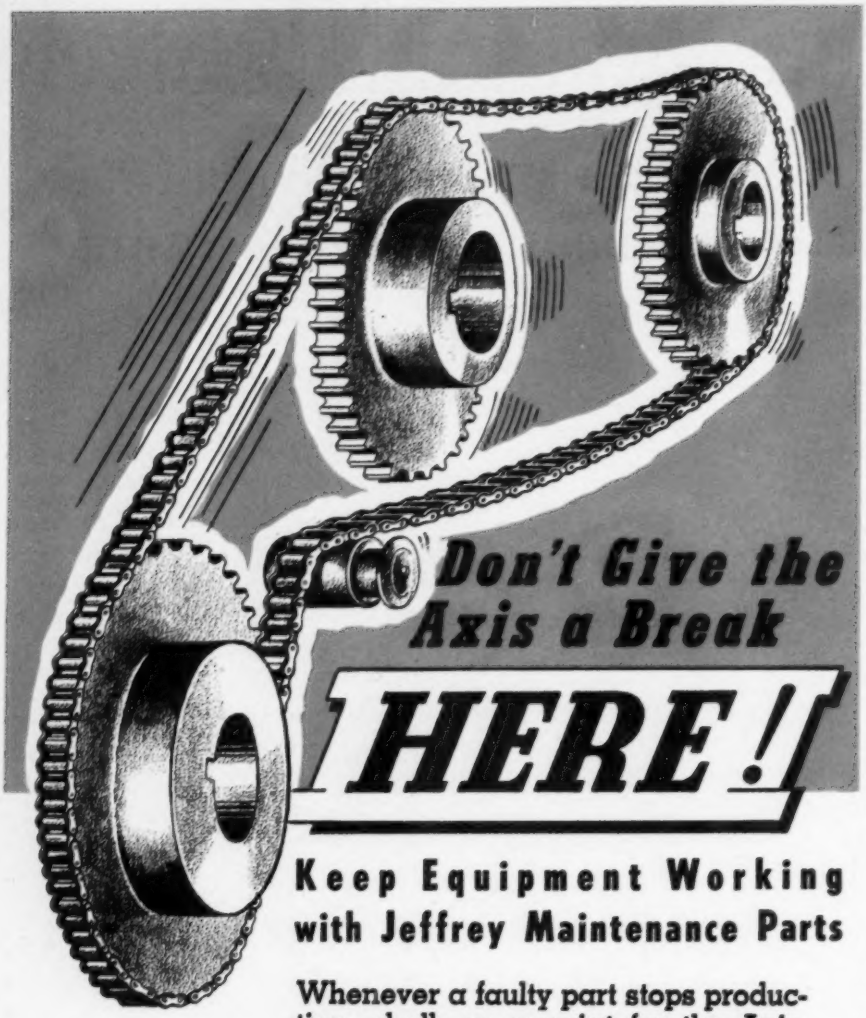
Would you like data on other Republic products—Enduro Stainless Steel, Sheets, Plates, Pipe, Upson Bolts, Nuts and Rivets, Hot Rolled and Cold Drawn Bars, Electrunite Boiler and Condenser Tubes? Write us.



Keep Equipment Working with Jeffrey Maintenance Parts

Whenever a faulty part stops production, chalk up a point for the Axis. Even the smallest break can act as a brake on the entire production line.

Jeffrey maintenance parts can take it. They have the toughness that holds up giant-like under the hardest going. That's why the word has gone out in hundreds of industries and plants: "Specify Jeffrey."

Always try Jeffrey first. Jeffrey "in stock" supply of maintenance parts is kept as complete as present conditions permit.

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numbers in War Department Specifications PE-623. Imperial Brass Mfg. Co.

–26–

FOOD–"Why Feed Your Employees?" tells the story of how a steel plant met its problem of feeding employees quickly and easily. Food served in paper containers and waxed wrappers from a lunch booth in the shop was the answer. Mono Service Co.

–27–

FOREMEN TRAINING–Two folders explain both need for and means of training foremen. Four services are available–two built to order, two ready to use. Trade-Ways, Inc.

–28–

FURNACES–of the heat-treating car hearth type are illustrated in bulletin No. 68-F. Central control system emphasized. High and low temperature direct-fired furnaces and convection types are included. R-S Products Corp.

–29–

HANDLING EQUIPMENT–Attractively illustrated looseleaf binder shows industrial trailers and trucks and parts, dump hoppers, and heavy-duty steel swivel and rigid casters. Lists specifications. Diagrams shown. Rose Manufacturing Co.

–30–

HEATING AND VENTILATING–A series of 11 "Proof of Result" bulletins devoted to specific heating or ventilating problems and their solution form a looseleaf binder. Actual testimonials are given. ILG Electric Ventilating Co.

–31–

IDENTIFICATION PHOTOGRAPHS–Eight-page folder shows equipment that is portable and easy to operate for taking identification badge photographs. "Five minutes from pose to picture" is claimed. Junior and senior models are described also, and separate list of users is attached. Marsk & Fuller, Inc.

–32–

ION EXCHANGERS–for Industrial Processes is title of leaflet that covers the application of ion exchange for non-water conditioning uses. Some of the products, processes, and industries in which ion-exchangers may be useful are listed. Permutit Co.

–33–

LEATHER BELTING–Mailing piece with attached business reply card makes facts on how to get more production with Tannate belting quickly available. J. E. Rhoads and Sons.

–34–

LIFTERS – Well-illustrated catalog called "Economy Lifters" describes types of lifters and various applications. Bulletin 220 tells

HYDRAULICS Rodgers KEEP THE WORLD MOVING

Visions of Today

Manufacturers of:
UNIVERSAL HYDRAULIC PRESSES
TRACK PRESS EQUIPMENT
HYDRAULIC KEEL BENDERS
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PORTABLE STRAIGHTENER FOR PIPE AND KELLYS

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Buy U.S. War Bonds and Stamps!

AT THIS CRITICAL MOMENT of our history, Americans are called to be creators, the makers of a new order of civilization. Every individual must play his part with keenness and enthusiasm, and every common task must make some contribution to a United Victory. It is not enough to gaze in wonder at the latest inventions of the mind of man. We must look with prophet's eyes beneath the surface of things, and beyond the events of the moment to the things that are to come. Thoughtful people everywhere are looking to the future.

Today, the aviation industry has found it both possible and practical to use plastics and plastic ply-wood for many of its needs. Within the range of immediate possibilities are huge airliners, swift, sleek and strong, manufactured almost entirely of plastic materials. These huge airliners will be able to double their freight and passenger capacity, at speeds beyond our imagination, and at greatly reduced operating costs. Safety will be an important factor in these new airliners of the sky.

Tomorrow, when the critical days are over, and Victory is assured, Rodgers Hydraulic Moulding Presses will be available again.

Today, we are devoting our entire resources to the overwhelming defeat of the Axis and their systems of barbarous oppression. Rodgers Hydraulic Inc., St. Louis Park, Minneapolis, Minnesota.

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CERTAINLY—It Helps Protect America's Essential Weapons

The men and women in our war plants are America's most essential weapons. They MUST be kept on the job. Help prevent the millions of hours needlessly lost from work each year as the result of occupational diseases.

LAN-O-KLEEN*

Is a powdered soap of *mildly* alkaline reaction compounded with granular corn-meal which has been impregnated (by an exclusive process) with lanolin, an oil almost identical to the natural oils secreted by the skin glands. Lan-O-Kleen works mildly and without harsh chemical action as it cleans the hands and the lanolin helps nature to maintain a normal, healthy skin condition.

WEST PROTECTIVE CREAMS

Act as an external protection when rubbed on the exposed skin. These creams help guard the workers from most of the wide variety of skin irritants which may lead to dermatitis. A West specialist will help you determine which of the many West Protective Creams are best suited to protect the workers against the specific irritants handled in your industry.

*Trade Mark Reg. U.S. Pat. Off.

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CLIP TO YOUR BUSINESS LETTERHEAD PLEASE

West Disinfecting Company, Dept. J. 42-16 West Street, Long Island City, N. Y.

Please send me a SAMPLE QUANTITY of Lan-O-Kleen with which I will give your claim a practical test. Please include folder explaining its use.

Name_____ Title_____

WEST DISINFECTING Company

42-16 WEST STREET · LONG ISLAND CITY · N. Y.

about the "shop-lifter" for moving heavy dies. Economy Engineering Co.

–35–

LIGHTING—Designed to present the essential facts of productive wartime lighting, manual and price schedule on Birdseye lamps and lighting gives complete information on meeting main types of lighting requirements. Wabash Appliance Corp.

–36–

LIGHTING—Folder 729 discusses how to obtain suitable priority for conversion lighting and shows various factory-type lighting units. What WPB says on good lighting is reviewed. Edwin F. Guth Co.

–37–

LIQUID COATING—to prevent adhesion of welding spatter is described in 6-page folder. In addition to preventing the adhesion of spatter, "No-Spat" is claimed to be a corrosion and rust protective compound. List of features and directions for use are included. The Midland Paint & Varnish Co.

–38–

LUBRICATION – Small chart "Lubrication Hints for War Plants" gives seven steps for better maintenance. Reverse side tells of a simplified plant lubrication program for more efficient servicing. E. F. Houghton & Co.

–39–

METAL BASKETS—Form No. 595 illustrates 22 types of baskets and gives full data on shapes, accessories, attachments, and materials of construction and fabricating methods. Best resisting metal for specific conditions listed. Buffalo Wire Works Co., Inc.

–40–

METAL-DUPLICATING – system without dies is described fully in 32-page catalog. Shears, brakes, benders are pictured and specifications given. Several pages are devoted to photographs of parts and materials that can be formed. List of users is included. O'Neil-Irwin Mfg. Co.

–41–

MOLDED RUBBER GOODS—Starting with a brief description of the process used in molding most rubber products, catalog section 7020 has questions and answers on molds, mold cavities, costs, materials, tolerance limits, attachment of rubber to metal in molding, and the varied shape of molded articles. B. F. Goodrich Co.

–42–

MOTOR CONTROL—by synchronization what it is, and how it works is explained in bulletin GES-1724D. Metal cabinet-type enclosures for protecting the synchronous-motor control shown. General Electric Co.

–43–

MOTOR MAINTENANCE—Bulletin 30 on care of fractional horsepower motors aims to instruct the operator in overhauling and clean

We want to thank you, the many thousands of you who in the past few years have made Johnson's Wax-Fortified Paints and Enamels one of America's fastest selling brands. But now we must discontinue the manufacture of this most efficient paint. Certain of its ingredients are urgently needed for more important work in the war program.

To take over this job of protecting your surfaces in the most efficient manner possible today at the lowest cost, S. C. Johnson & Son, Inc., have developed Johnson's War-Formula Paints — retaining as many as possible of the outstanding advantages of Johnson's Wax-Fortified Paints.

AND NOW WE WANT TO TELL YOU ABOUT THESE

War-Formula PAINTS

. . . Specially Developed for

- *Mills*
- *Factories*
- *Foundries*
- *Power Plants*
- *Warehouses*
- *Machine Shops*
- *Offices*
- *Cafeterias*
- *Shipyards*

Skillful blending of fine paint resins by methods developed at S. C. Johnson & Son, Inc. gives these War-Formula Paints and Enamels the kind of endurance and the necessary economy of money and maintenance time so needed today.

Johnson's War-Formula Paints require no special preparation or care in application. Brush or spray them on old or new surfaces of wood, brick, metal, plaster or any painted or unpainted surface.

Send for full particulars today. These paints and enamels are specially made to meet present maintenance problems.

S. C. JOHNSON & SON, Inc.

Industrial Maintenance Division, Dept. FM-33

Racine, Wisconsin

"This catalog, illustrated, has specifications, send for yours today!"

S. C. JOHNSON & SON, Inc., Dept. **FM-33**
Industrial Maintenance Division, Racine, Wis.

Please send me a copy of your illustrated booklet, "Johnson War-Formula Paints," giving complete information on and specifications for the use of Johnson's new War-Formula Paints and Enamels.

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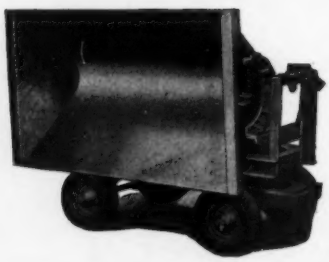

Among the hundreds of special handling problems solved by EWC Engineers, equipment has been produced to haul supplies and materials in various Army training camps. Our regular line of Materials Handling Equipment, plus the innumerable variations worked out by our designers, puts us in a position to help you meet every hauling job efficiently and speedily. Let us work with you, just as we have so successfully worked with thousands of others.

WRITE FOR BULLETINS, Prices and Helpful Suggestions applying to your own special needs.

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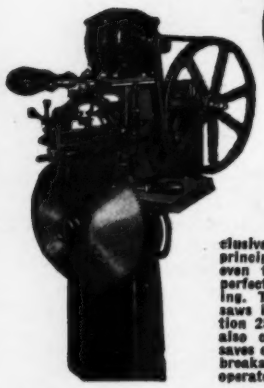
ELECTRIC WHEEL CO.

DEPT. FA QUINCY, ILL.

FOLEY FILED SAWS Increase Sawing Production

25% TO 40%



Your saws will cut faster and truer and stay sharp longer when filed on a Foley Saw Filer. The exclusive patented Foley jointing principle straightens up uneven teeth and makes them perfect in size, shape, spacing. That is why Foley-filed saws increase sawing production 25% to 40%. The Foley also cuts down filing time, saves on files and reduces saw breakage. Any man or boy can operate the

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The Foley Filer is the only machine that sharpens cross-cut circular saws 3" to 24" in diameter, band saws ⅛" to 4½" wide—all hand saws.

FILING SAWS FOR VICTORY

The Foley Filer is in use by U. S. Army, Navy, Air Force and many other Gov't Depts.—also by hundreds of war and industrial plants.

30-DAY TRIAL OFFER

Find out on your own work how much the Foley Filer can save you. Write today for folder and full details of our 30-day trial offer.

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45 Second St. N.E. Minneapolis, Minn.

Also makers of Foley Saw Grinders, Setters, etc.

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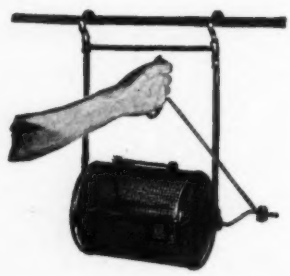
FOR EFFICIENT ELECTROLYTIC CLEANING . . .



Here's a basket that with occasional rotation by hand maintains good electrical contact in batches of small parts and still insures uniform exposure to the acid. Thorough cleaning results.

Ask ROLOCK engineers to design the processing carriers you need to meet any and all conditions of weight, temperature, acid concentration, thermal shock, loading and unloading. Light or heavy metal baskets, trays, crates, fixtures, etc., of any desired materials, carrying from a few ounces to 4,000 lbs.

ROLOCK, INC.

1500 Kings Highway East, Fairfield, Conn.

ing his motor properly. Each problem and procedure illustrated with photographs, cutaway views, and diagrams. Dumore Co.

–44–

PAINT—For waterproofing brick, concrete or masonry walls is the subject of the folder "Aquella – Waterproofing Paint." Features and properties are concisely outlined. Modern Waterproofing Paint Co.

–45–

PAINT AND VARNISHES—Pictorial brochure entitled "These Plants Make the Paint That Preserves America" has the twofold purpose of better acquainting employees with its company and of bringing the story of the Devoe organization to the public. Devoe & Reynolds Co., Inc.

–46–

PAINTS—brushes, and sundries are fully described in helpful maintenance and buying guide. A directory of products and their uses, color charts, and a detailed inspection guide make the catalog useful in solving paint problems. Complete line of painting and papering accessories also listed. Pittsburgh Plate Glass Co.

–47–

PAPER BAGS—Booklet on wartime packing problems illustrates heavy-duty shipping sacks, protection-plus bags, small parts bags, inter-office communication envelopes, etc. Equitable Paper Bag Co., Inc.

–48–

PIPE—By means of tables, text, and drawings, bulletin entitled "Redwood Pipe" deals with the problem of installation of four types of redwood pipe—continuous stave pipe, machine banded pipe, bored, and lined metal pipe. California Redwood Assoc.

–49–

PNEUMATIC LOADING—of Industrial "Machinery," bulletin B-306, describes loading method in which air pressure replaces weights, levers, or other mechanical devices to establish the nip of roll type machines. Schematic drawings and listings of uses. Foxboro Co.

–50–

PORTABLE ELECTRIC TOOLS—"They Used Their Heads" gives case histories of the adaptation of portable electric tools for emergency war uses. Records actual stories of ingenuity of men who make tools work for them. Black & Decker.

–51–

PORTABLE SANDER—Form S-200 pictures the Sterling 1000 portable electric sander and tells what it does and how it works. Specifications are also listed. Sterling Tool Products Co.

–52–

POSTERS—bulletin boards, bulletins are described in three folders. Poster series are devoted to conservation, safety and health, news, management-employee relations, pay-

AIR SUPREMACY...

RESULTS DIRECTLY FROM ACHIEVEMENT
ON THE PRODUCTION LINE

Higher Speeds, Better Finish, Longer Tool Life with

EN-AR-CO PROMAX CUTTING OILS

• Here's what a change to En-ar-co PROMAX Cutting Oils did for a Michigan Manufacturer, forming and cutting off nickel steel aircraft parts on Acme Gridley Automatics:

Before using PROMAX, indexing at 85 seconds, tools were reground at four-hour intervals and finish while passing, was not entirely satisfactory.

With correct grade of PROMAX Cutting Oil, the machine was speeded to index at 54 seconds, and higher speed notwithstanding, finish of work was improved and the interval between tool grinds was eight hours.

Needless to say the entire plant is now standardized on PROMAX.

Write today for information on the PROMAX Cutting Oils best fitted to your specific production needs.

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Cleveland • Indianapolis • Chicago • Peoria • Omaha • Kansas City • Memphis

Distinctive Work Clothes for Women

For safety, comfort, variety of styling, carefully designed to give freedom of action. Workmanship in keeping with high standards of 30 years of successful manufacturing of washable uniforms. Let us show you variety of styles designed to satisfy your workers in every detail. Non-bulky—preshrunk.

This coupon will bring you swatches and styles

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Send complete information on Work Garments for women

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"Keep 'Em Rolling" on
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Save Time, Labor and Money

Casters in Industry are vitally important and play no small part in the job of "keeping things moving." Hamilton Casters have a third of a century experience behind them—they perform well and last long—conserve time and labor—speed up the war effort. There is a Hamilton Caster for every Industrial Need. Send for complete catalog.

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1760 Dixie Highway, Hamilton, Ohio

HAMILTON CASTERS
Made Right and Priced Right

duction and quality. Bulletins are designed to help foremen by giving them up-to-the-minute management information. Elliott Service Co.

–53–

POWER TRANSMISSION – A 388-page "War Time Manual of Mechanical Power Transmission" No. 42 gives complete descriptions, diagrams, engineering data, dimensions, and prices of thousands of power transmission appliances. Also section on belt conveyors for bulk materials handling. Dodge Mfg. Corp.

–54–

POWER TRUCKS–"Lady, will you give a lift?" is title of instruction manual for operating power trucks that has been especially prepared for women without previous mechanical training. Technical instruction is given in an easy, direct, conversational style, and the manual emphasizes the importance of the job. Large photographs help explain the text. Elwell-Parker Electric Co.

–55–

PRODUCTION CONTROL BOARD–How the control board works is illustrated and explained in leaflet. Board is designed to fit individual problems of scheduling, parts, inventory, loading, delivery dates, etc. Tablet & Ticket Co.

–56–

PUMPS–"Handbook for Wartime Care of Centrifugal Pumps" applies to all makes of pumps. Centrifugal pump is built step by step, each part being analyzed to see how it works and how it should be cared for. Allis-Chalmers Mfg. Co.

–57–

ROLL COVERINGS–Facts about cots and aprons are contained in the illustrated catalog, "Modern Textile Roll Covering." Compares advantages of varying roll materials. Chart summarizes uses. Armstrong Cork Co.

–58–

ROLLS–Wood, metal, and rubber rolls and their construction and use is the subject of handy catalog No. 740. Dimension sheets, information charts, and a section for sketches and notes make the booklet useful. Rodney Hunt Machine Co.

–59–

RUBBER–"Typical Examples of B. F. Goodrich Development in Rubber" reproduces 26 advertisements run by this company in 1942. Each gives picture and story of one development. B. F. Goodrich Co.

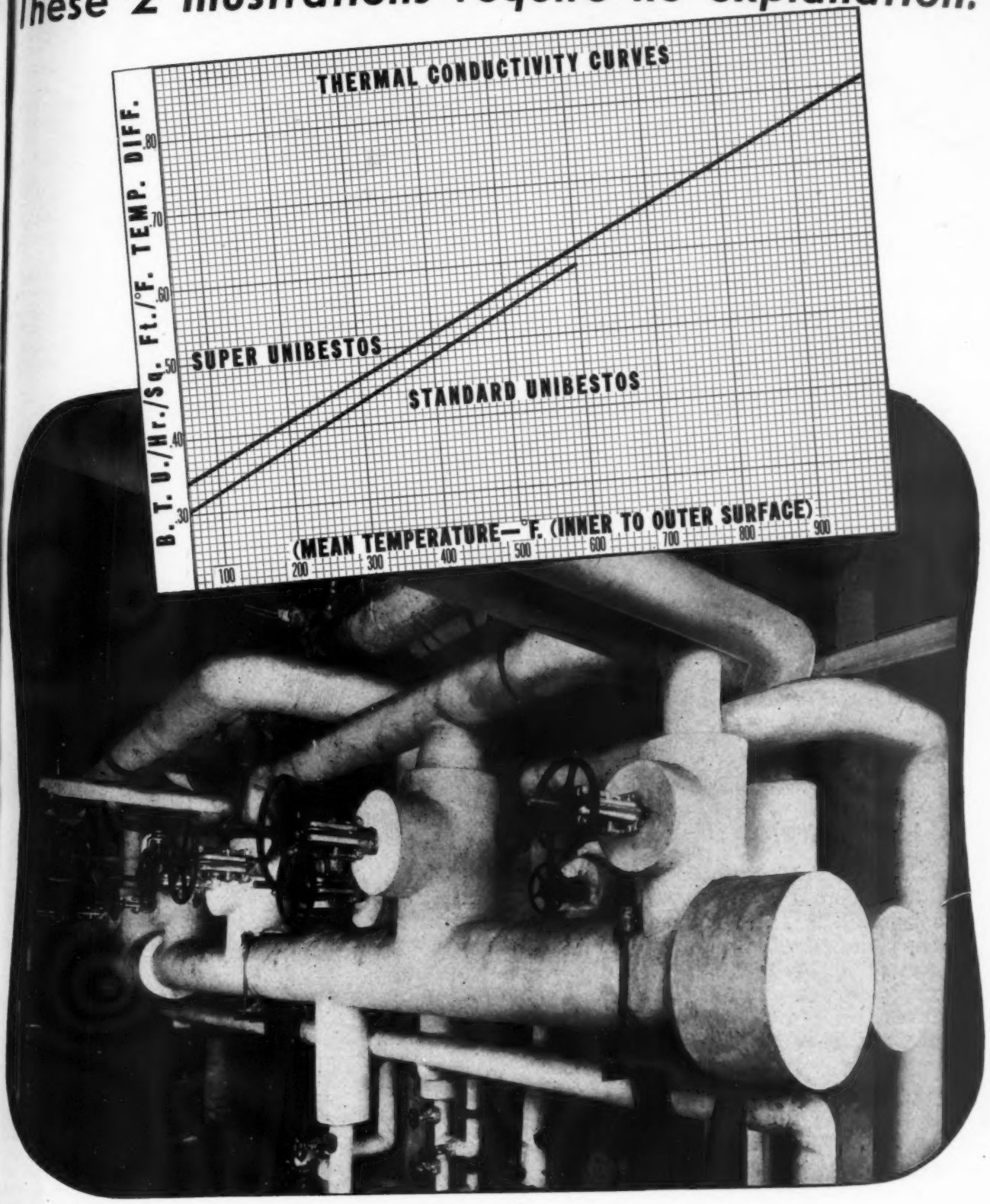
–60–

SEALING MATERIALS–Data sheet giving properties of materials used in coating or impregnating felt and sample card showing nine rubber-like felt sealers present a brief explanation of impregnated felt and its uses. Automotive Rubber Co.

–61–

SHEARS–The hand-operated shear for wire rope cutting and the hydraulic wire rope shear

These 2 illustrations require no explanation!



UNARCO

unibestos is available in Standard material, for temperatures up to 750°; Super, with a temperature limit of 1200°; Combination, with a temperature limit of 1200°. These temperature limits permit the use of one material at maximum efficiency for a wide range of purposes. Unibestos is available in half sections up to 30" pipe diameter and from 3½" to 60" in quadrants from ¾" to 5" in thickness. Standard and Super are available in single layer construction with provision for expansion in piping, where required.

Conserving the Vitamins of Industry: B.T.U.'S!

UNION ASBESTOS & RUBBER CO.

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A-1-A
PRIORITY ON PERFORMANCE

"Built-in" Motor Drive with Cooling Unit All Mounted on Steel Base

• Throughout the many years of SCHRAMM operation they have been tops in performance; so now when economical, dependable and speedy performance is necessary in the present Victory drive, SCHRAMM is prepared to answer the call.

SCHRAMM Compressors are designed for heavy-duty, continuous service and will perform such service with least up-keep and operating costs. They are available for flat belt or complete "V" belt drive, "built-in" motor drive with compressor and motor assembled rigidly and in perfect alignment. Units are light, compact and easy to handle, reducing headroom and floor space requirements.

BUILT IN SIZES
from 50 to 600
Cu. Ft. Displacement

WRITE FOR CATALOG 42-S

SCHRAMM INC., WEST CHESTER, PA.

SCHRAMM *The Compressor People*

are described and illustrated in Bulletin 740-A. Specifications given. Watson-Stillman Co.

–62–

SOUND PRODUCTS—Only items currently used in sound installations carrying priorities are listed in Catalog 217. Amplifiers and accessories, microphones and accessories, speakers, telekoms, portable sound system, etc., are illustrated. Radio Corp. of America.

–63–

SPEED REDUCERS—"There's More Than Meets the Eye" is title of booklet that shows 42 years of progress in speed reducers made by this company. Pictures of early models "in the days of a bicycle built for two," photographs of present equipment, and views of the factory are included. Typical problems solved, users, and service folders are listed. Winfield H. Smith, Inc.

–64–

STAMPINGS—in small quantities and done by a quick process method are explained in folder. HPL Manufacturing Co.

–65–

STITCHERS — Informative 6-page "Silver-stitcher" folder describes in detail various standard and special types of carton stitchers available to shippers of war products. Acme Steel Co.

–66–

SWEEPER—The "sweeping crews on wheels" appear in 2-color catalogs. Six-page catalog presents the motorized sweepers, Commander and Fleetway. Four-page catalog shows the manually operated model, the Detroit. Moto-Mower Co.

–67–

TACHOMETERS—Bulletin No. 790 describes the Model J single range hand tachometers of the centrifugal mechanical type. Six different ranges are available for speeds from 100 to 10,000 r.p.m. Herman H. Sticht Co., Inc.

–68–

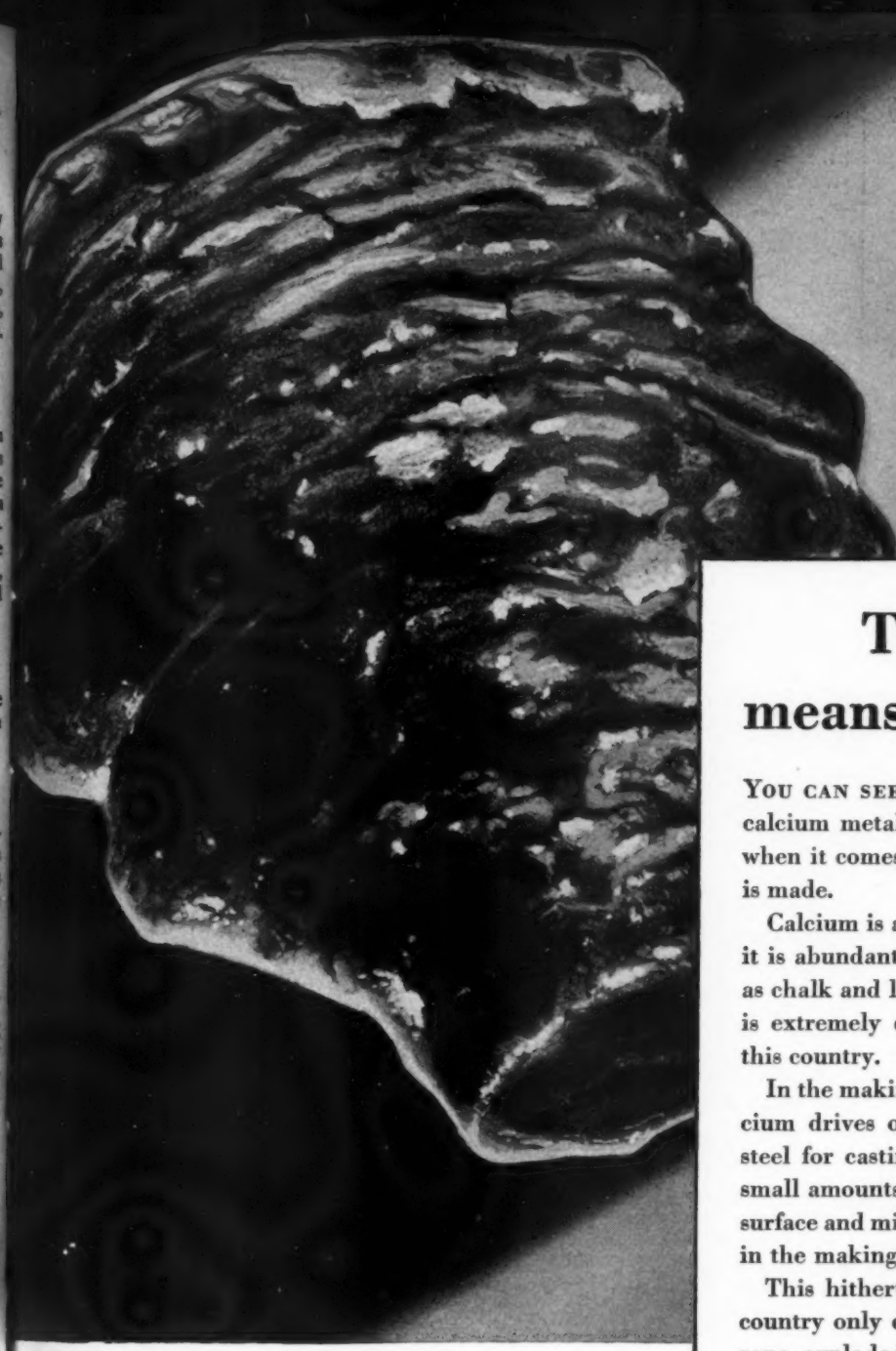
TAPPING MACHINES—Specifications, photographs of whole machines and individual parts, spindle speeds table, and list of users are included in 12-page, two-color catalog. Bakewell Mfg. Co.

–69–

TEMPERATURE REGULATION—Timely, helpful information on how to reduce the consumption of heating fuel with the use of regulators is contained in "Manual of Temperature Regulation." Charts and diagrams present a comprehensive study. Marsh Tritrol Co.

–70–

TWO HUNDRED—years of continuous operation are portrayed in words and pictures in handsome 53-page booklet. History of the company and photographs of past presidents, pictures of old records, products, and loca-



This "Carrot" means healthy metals

YOU CAN SEE why metalworkers call this lump of calcium metal a "carrot." This is the way it looks when it comes from an electrolytic cell in which it is made.

Calcium is a soft, silvery-looking metal. Although it is abundantly present in such common materials as chalk and limestone, its recovery as a pure metal is extremely difficult. Yet it is vitally essential to this country.

In the making of stainless or high-alloy steels, calcium drives out impurities, giving cleaner, better steel for casting or rolling. In magnesium casting, small amounts of calcium improve the finish of the surface and minimize scaling. Calcium is an essential in the making of many metals.

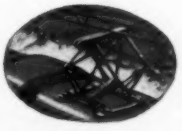
This hitherto rare metal has been made in this country only during the past few years. Before Europe exploded, the United States was dependent upon France as a source of supply.

But back as far as 1935, thinking that this country should have a domestic source, ELECTRO METALLURGICAL COMPANY, a unit of UCC, started a major research program. After four years of work . . . as French supplies dwindled . . . a plant was put into operation for the manufacture of the gray metal. Today, ELECTRO METALLURGICAL COMPANY produces many times as much calcium metal as this country ever imported . . . and production is increasing.

IN THE AIR SOONER! Vital aircraft parts flow from production lines quicker because the use of calcium metal results in better metal.

BETTER HEALTH! Pure calcium metal is used as a drying and purifying agent in the manufacture of certain new disease-fighting drugs.

CHEMICAL HELPER! Calcium is necessary in making a number of rare metals—many of which heretofore were unavailable commercially—and all of which are vital.



METAL-SAVER! In the melting of copper scrap for use in certain types of electrical equipment, calcium is used as a purifier and a restorer of electrical conductivity.

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UCC

30 East 42nd Street New York, N. Y.

Principal Products

ALLOYS AND METALS
ELECTRODES, CARBONS AND BATTERIES
INDUSTRIAL GASES AND CARBIDE
CHEMICALS PLASTICS

BUY UNITED STATES WAR BONDS AND STAMPS

GLOBE LIFTS SPEED WORK AND SAVE MANPOWER

Used for Lifting, Loading and Materials Handling

Let a Globe Oil-Hydraulic Platform Lift do the heavy lifting in your plant . . . on your production line . . . at your loading dock . . . wherever women or older workers are doing your war-time job.

Smooth, accurate, husky oil-hydraulic lifting power, at finger-tip control, will reduce fatigue, prevent strain or injury and insure speedy handling.

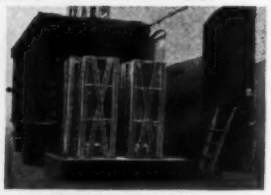
Globe Engineering Consultation Service is available to you without cost or obligation. Let us help you solve your lifting problems. Globe equipment is in service in scores of busy war plants today. Three commonly-used types are illustrated below:

Speeds Machine Feeding Operations

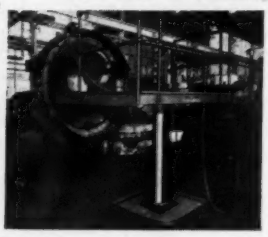
Foot-controlled Globe Platform Lift speeds machine feeding.

Truck Loading—A One-Man Job

Globe Loading Dock Lift eliminates ramps and skids.



Lifts Men to Working Levels



Globe Lift raises welder and equipment to proper height.

Write: For illustrated bulletins on Globe Lifts and Elevators, address, Globe Hoist Company, Queen & Mermaid La., Philadelphia.

GLOBE HOIST COMPANY

Philadelphia, Pa. Des Moines, Iowa

GLOBE
LIFTS *and* ELEVATORS

tions, as well as illustrations of up-to-date products and contemporary activities, are all included. Photographs of employees who have been with the company more than 50 years are shown also. Taylor-Wharton Iron & Steel Co.

–71–

TURRET MILLS–Catalog presents concisely "Perfect 36" vertical turret mills for boring, drilling, and turning. Illustrations show various uses. Condensed specifications of standard and high speed models given. Rogers Machine Works, Inc.

–72–

VALVES–Illustrated manual of globe and check valves, bulletin A-4 is sectioned and tabbed for quick reference. Headings include bronze globe, forged steel globe, balanced stop, bronze check, forged steel check, and cast steel check valves. Pressure ratings, dimensions, and prices tabulated. Engineering data given. Watson-Stillman Co.

–73–

VALVES–"Where to Use Valves, Drains, and By-Passes" is a handbook covering the fundamentals of valves. Its 32 pages tell which valves to use, types of valves and applications, and where to use them. Jenkins Bros.

–74–

VARIABLE-SPEED DRIVE – Eight-page Bulletin 310 describes and pictures speed control units, lists their advantages. Three single-page bulletins, entitled "Answers to Who Is Doing What With an All-Electric Speed Drive," "More Answers," and "Still More Answers" show actual installations. Reliance Electric & Engineering Co.

–75–

VIBRO-INSULATORS – Catalog 7900 together with engineering work sheet No. 7901 gives complete information on vibro-insulators and enables a plant to compile data that aids in choosing the proper installation. B. F. Goodrich Co.

–76–

WIRE–Formex magnet wire which is easy to wind and runs more feet per pound is described in catalog GEA-3911. Properties, advantages in use, types available, application, data tables make up the contents. General Electric Co.

–77–

WIRENUTS–Solderless, tapeless wire connectors that screw on. Leaflet points out why they are speedy and handy to use and lists various sizes available. Ideal Commutator Dresser Co.

–78–

WIRING–Form 516 describes and illustrates industrial application of Wiremold No. 3000 system wiring, used as branch circuit feeder raceway for plant power and lighting circuits. Plugmold, plug-in-anywhere convenience, also covered. Wiremold Co.

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Send for your copy

Reznor has manufactured gas heating equipment exclusively since 1888. This solid foundation of long and broad experience enabled the company to develop and build outstanding features in its gas fired unit heaters. Reznor Units are available in 3 types and 9 sizes. No other type of equipment can be installed as quickly, and at the same time, 89% of vital materials is saved. Reznor Gas Fired Heaters also move more warm air over wider areas. Catalog U 42 tells with descriptive pictures and words how and why Reznor equipment will operate to advantage for you.

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REZNOR MANUFACTURING CO.

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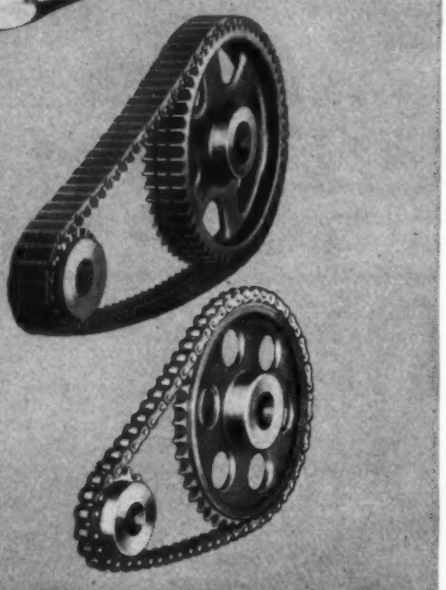
"GAS HEATERS EXCLUSIVELY SINCE 1888"

UNITED STATES WAR BONDS AND STAMPS

MORE DRIVES *Using Chains*



When production requirements were a fraction of output capacity . . . when top machine efficiency was not vital . . . and lost down time could be handled by idle standby equipment and did not mean a possible loss of American fighting men's lives . . . then inefficient drives got by!

Now, planes and tanks, ships and guns are needed fast . . . parts production is vital . . . every K.W. of power . . . every R.P.M. . . . has an important job to do.

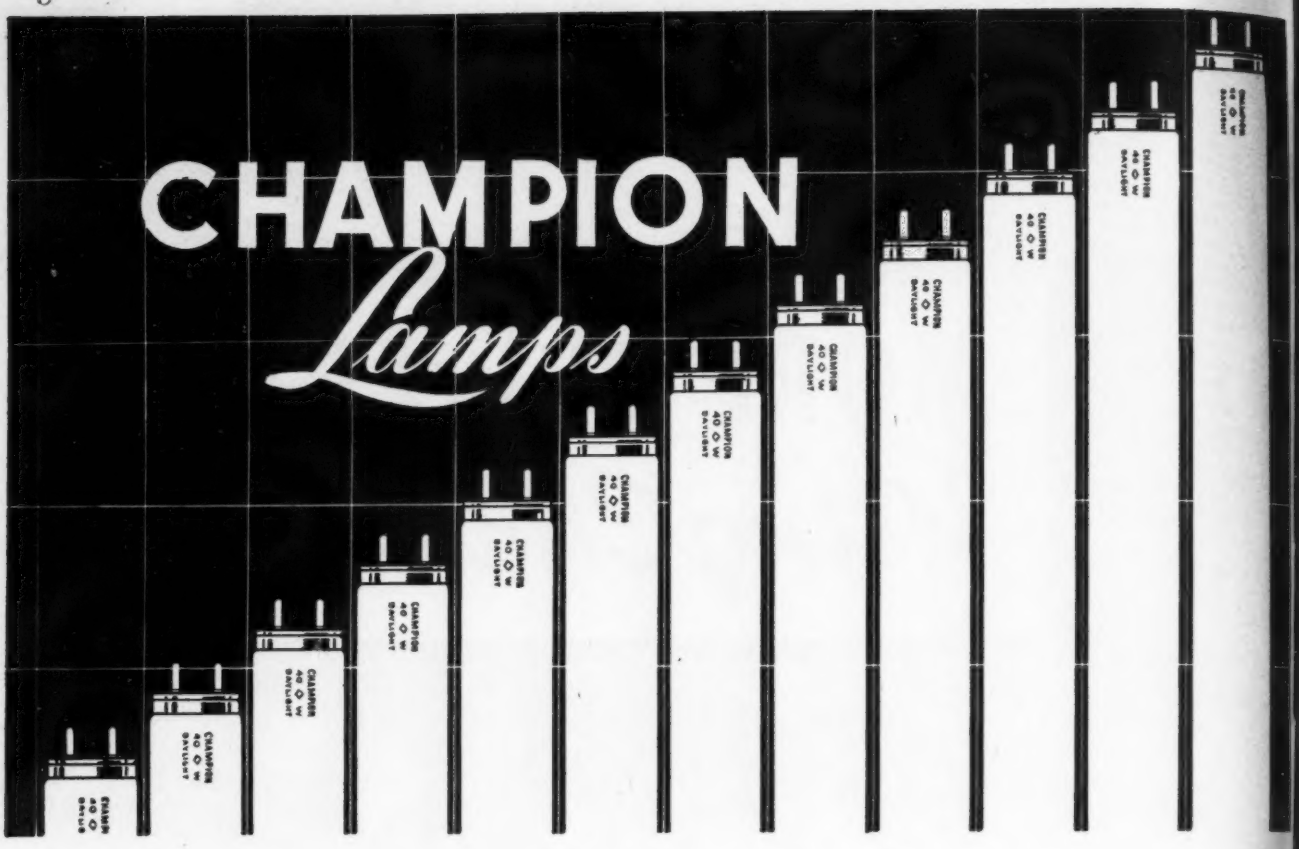
To meet today's production demands, more and more manufacturers are modernizing machine tool drives with Morse Chains, and specifying Morse Chain Drives on new machines. Many have found production increased as high as 25%, servicing time reduced, slipping and frictional contact losses eliminated and uniform production maintained.

Morse Engineers will help you modernize your drives for greater production.

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA N. Y. DIVISION BORG-WARNER CORP



. . . are stepping up war production

Round the clock production would be totally impossible without continuously dependable electric lamps.

That's why the makers of Champion Lamps are exerting every ounce of effort to keep on providing lamps that live up to the Champion Diamond's four points:

1. **Champion Quality** — backed by forty-three years of specialization and a guarantee to equal or exceed Federal Specifications.
2. **Champion Service** — stocks for essential needs and trained lamp men in the field.
3. **Champion Economy** — lower light and lamp cost than those of any other lamp of equal quality.
4. **Champion Distribution** — through qualified industrial suppliers equipped to meet emergency needs efficiently and economically.

WRITE FOR THIS MANUAL of practical, timely information on how to make the most of your present lighting and lamps. Simply give your name, company and position, asking for Champion Manual C.

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A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

O.W.I. by Palmer, in an Allegheny Ludlum Plant

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For Allegheny Ludlum, that is true in the cases of stainless steel, gasoline engine valve steel, and many alloys for electrical purposes. It is true also of certain tool and die steels, notably the DBL High Speed Steel analysis, which has replaced "18-4-1" on the majority of the nation's production jobs.

These steels of our development are among the most vital of the war. We want to place our "know-how" completely at your disposal, to help you select them wisely and use them well, without waste. ● Call on us for technical and fabricating data, or for the help of our Technical Staff.

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TAYLOR-MADE CHAINS

KNOW CRANE SIGNALS AND USE THEM FOR—

. . . Protection of yourself and others
. . . Protection of loads and chains
. . . Speed-up in Production

TRAVEL

Forearm vertical, hand open. Wave forearm in direction of travel.

HOIST

Forearm vertical. Make small horizontal circles with hand

STOP

Arm extended, hand level with hip. Hold position rigidly.

EMERGENCY STOP

Arm extended, hand level with hip. Move hand quickly to right and left.

LOWER

Arm extended, hand below hip. Wave forearm downward.

RACK

Arm extended, hand just above hip, fingers closed, thumb extended horizontally. Jerk hand in direction of racking.

TAYLOR-MADE

Flash-Alloy Steel

CHAINS AND SLINGS

Each link an absolute weld of *both* sides. Re-enforcing bulges inside *each* side of link. T-M Heat Treatment, T-M Design for longest most satisfactory performance. There's a T-M chain for every job. Write for complete catalog.

TURN IN YOUR SCRAP NOW!

ESTABLISHED 1873

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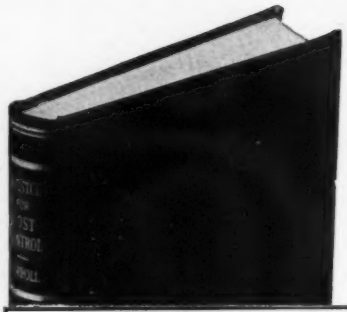

How to make timestudies, and how to use them

to lower costs and improve managerial control

TIMESTUDY for COST CONTROL

By PHIL CARROLL, Jr.
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287 pages, 6 x 9
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—the view of measurement and timestudy as a tool of management that holds out many advantages to plants of all sizes

—the fundamental information on the installation of timestudy for cost control, the description of the work involved, the type of personnel fitted for it, departmental organization, the equipment needed, training for the observer, etc.

—the expert information on how to make comparison sheets, how to handle set-up time, how to write up standard data, how to handle variables, etc., and how to complete the important steps of setting and recording the standard

—the chapters making plain the methods of applying timestudy data, not only in wage incentive work, but also for purposes of control invaluable in many departments of the business

—the methods of determining consistent work standards for about one-seventh the cost incurred by usual individual timestudy method

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THIS book outlines step by step one practical method of completing the timestudy measurement and control of cost without rearranging the shop. It has eliminated many technicalities and method variations to concentrate on the preparation and use of standard data, as opposed to the very costly process of individual operation timestudy. Not only does the method described permit of a much wider field of application, but the author shows wherein it logically extends beyond simple incentive to form the basis for many managerial controls.

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Today, the advantages of Kerlow Open Steel Flooring are more important to industrial plants than ever before. Here are five reasons why: 1. Safety . . . open-mesh, non-skid design reduces accidents. 2. Light . . . as 85% of floor area is open, there is ample passage for light. 3. Ventilation . . . air, fumes, heat and odors pass through floor openings readily. 4. Permanence . . . will outlast any other type of floor. 5. Economy . . . first cost is low, installation is simple and only maintenance expense is occasional repainting.

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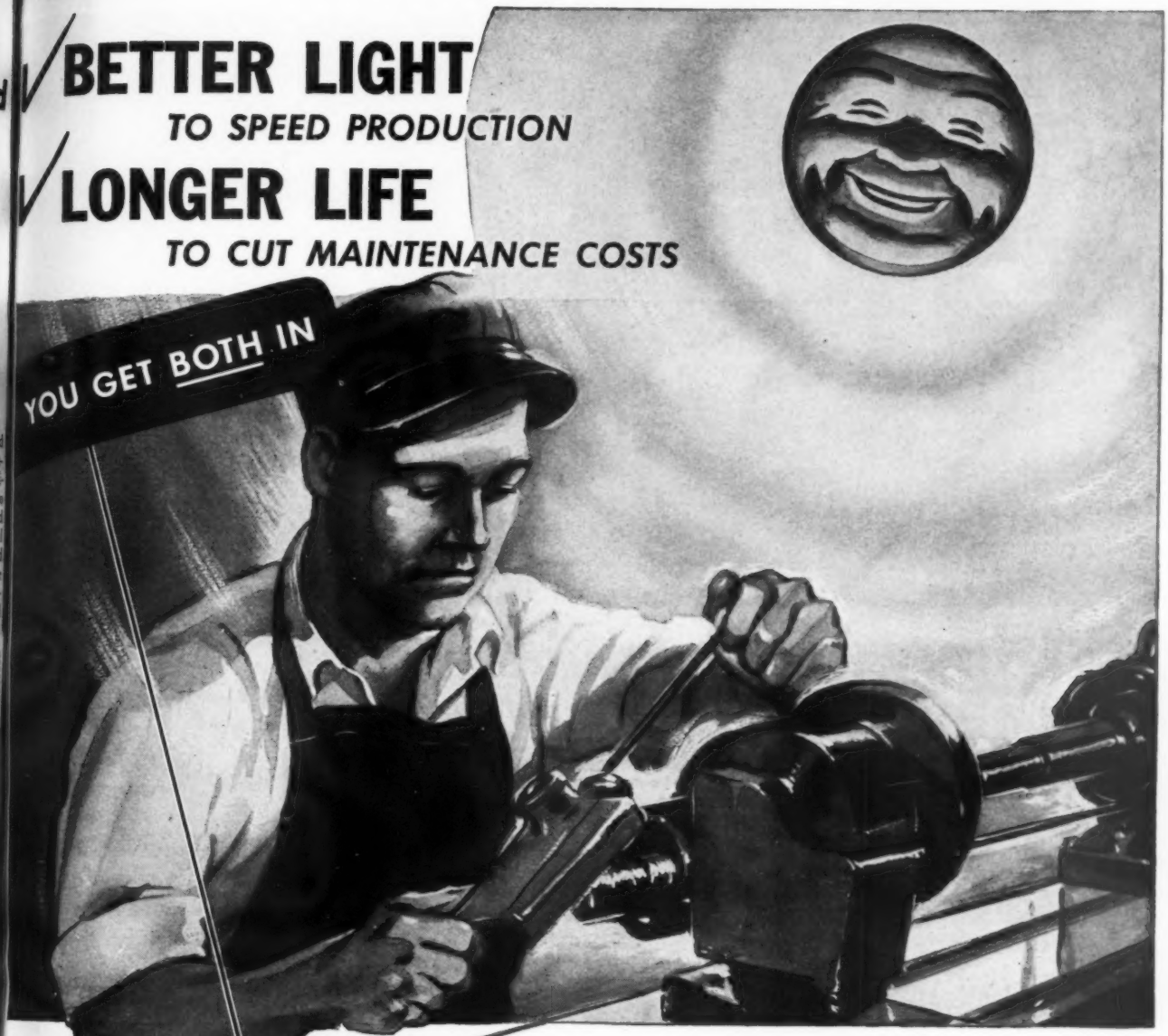
Make Every Pay Day a Bond Day — Buy U. S. War Bonds and Stamps

KERLOW RETICULATED DESIGN ...A PATTERN FOR VICTORY

✓BETTER LIGHT
TO SPEED PRODUCTION
✓LONGER LIFE
TO CUT MAINTENANCE COSTS



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If you have a communication bottleneck, consult an RCA sound engineer at once. Your time is too vital to waste.

In hundreds of war industries, RCA Sound Systems have supplemented buzzer and horn code signals, inter-office phone systems, and inter-departmental messengers as a means of establishing contact among administrative officers and personnel.

The reason—with an RCA Sound System, you can speak personally, instantly, and through high noise levels, to anyone or *everyone* in your organization.

RCA Sound Systems give you literally lightning communication, in these days when time is far more valuable than money.

Not only can you locate and communicate immediately with executives, keymen, maintenance men, and visitors no matter where they are in your office or plant; but you can contact your entire personnel in the event of air raid, fire and police alarms, or emergency announcements of all kinds.

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RCA Sound equipment is so flexible that our engineers would have no difficulty tailoring one precisely to your individual needs. You will find, as hundreds of other war industries have found, that RCA Sound Systems pay for themselves many times over.

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Which of these

HIGH PRESSURE CONTAINERS

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SHATTERPROOF?

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Looking for a cylinder that's just right for *your* purpose? Then select it from the wide range built by Walter Kidde & Company. You can probably find the exact size, shape, weight you need . . . the right valve or release mechanism . . . the correct strength. And if your requirements are too special to be covered by existing equipment, Kidde engineers will be glad to work with you to develop the right container that exactly fills the need.

Kidde cylinders are used for storing liquefied carbon dioxide and hydraulic fluids, under pressure, for oxygen, nitrogen, helium and other gases.

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HIGH PRESSURE GASES · FIRE PROTECTION

PROTECTS LIVES

How to Keep YOUR

Electric Cranes & Hoists

THE MAINTENANCE MAN'S CREED—"An ounce of prevention is worth a pound of cure."—was never more significant than it is under today's grueling production schedules.

IN THE MANUAL illustrated here, for use with Shepard Niles' Cranes and Hoists, maintenance men will find the answer to many problems of crane and hoist care and operation. This manual has been planned expressly to do two things:

FIRST, to assist the war effort, by helping to prevent costly shutdowns, through timely suggestions on crane and hoist operation.

SECOND, to help the maintenance man make repairs on the spot, quickly and efficiently, through furnishing him with detailed information, amply illustrated and easily found, concerning the construction of Shepard Niles' Cranes and Hoists.

Shepard Niles

CRANE & HOIST CORPORATION

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●104 pages—amply illustrated with sectional views and line drawings. Covers the complete line of Shepard Niles' Electric Cranes and Hoists. Sturdy, flexible cover. Special binding for easy opening. Convenient (7¼" x 10¾") size.

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FOREMANSHIP and SAFETY

110 pages

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by C. M. MacMillan

AN important new book for foremen and superintendents—that shows how to cut down accidents—prevent illnesses—and increase the number of working days. Full of sound common sense—this book tells the fundamental principles of industrial safety—and gives proved methods and tested suggestions that hold the interest of workers and convince them of the importance and necessity of safety.

SHOWS HOW

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- To prevent avoidable illness
- To lower number of days absent from work
- To make safety pay dividends

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THESE 3 Westco ADVANTAGES MEAN IMPORTANT SAVINGS IN YOUR PUMPING JOBS!

TWO-STAGE PERFORMANCE AT SINGLE-STAGE COST

▶Because of the unique turbine design of Westco Pumps, a *single*-stage Westco will continuously supply high operating pressures that would require a *two*-stage centrifugal pump. Thus, Westcos save on *first* cost...on *operating* cost...*on maintenance!*

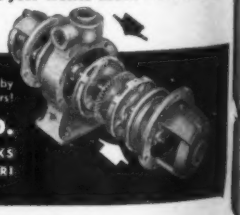
PERMIT FUTURE EXPANSION OF SYSTEM

▶Westco operating characteristics are such that additional outlets can be handled with *decreasing* horsepower requirements... whereas centrifugals would require *additional power* to maintain operating efficiency. In this way, Westcos reduce *both* cost of expansion and cost of operation if future additions to system become necessary.

PROVIDE STANDBY PROTECTION AT LOWEST COST

▶Westco's *renewable liner* feature eliminates need for an entire separate pump assembly for safe standby protection. By simply keeping an extra liner assembly on hand, Westcos can be quickly and economically renewed at a *fraction* of ordinary cost.

Get the full Westco story of peak performance at unusually low installation and operating costs before you invest in ANY pump equipment. Ask your Westco dealer—or write direct!



On Westco Pumps, wear and corrosion are taken by *renewable* liners. To renew pump, simply renew liners!

WESTCO-POMONA PUMP CO.

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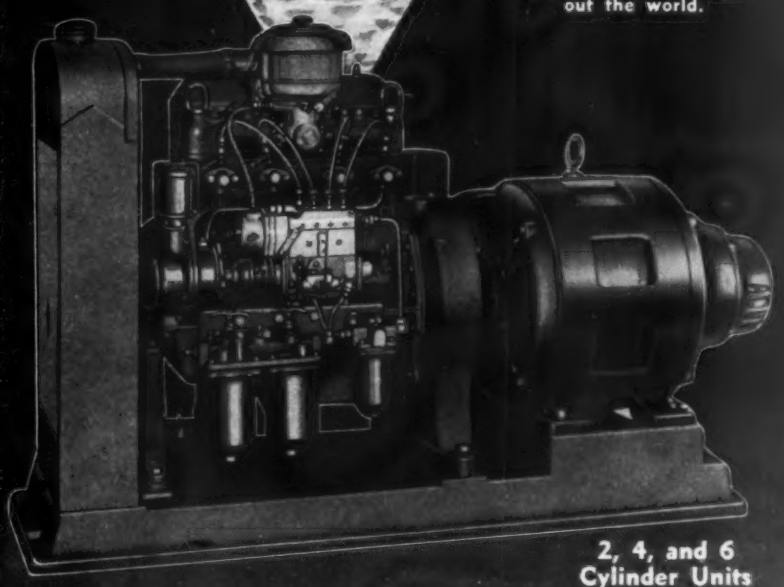

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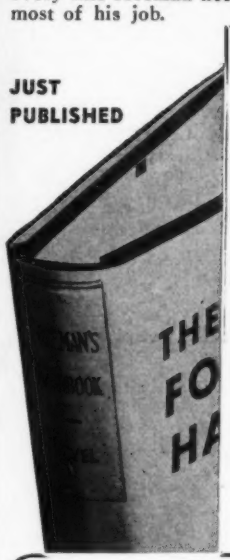

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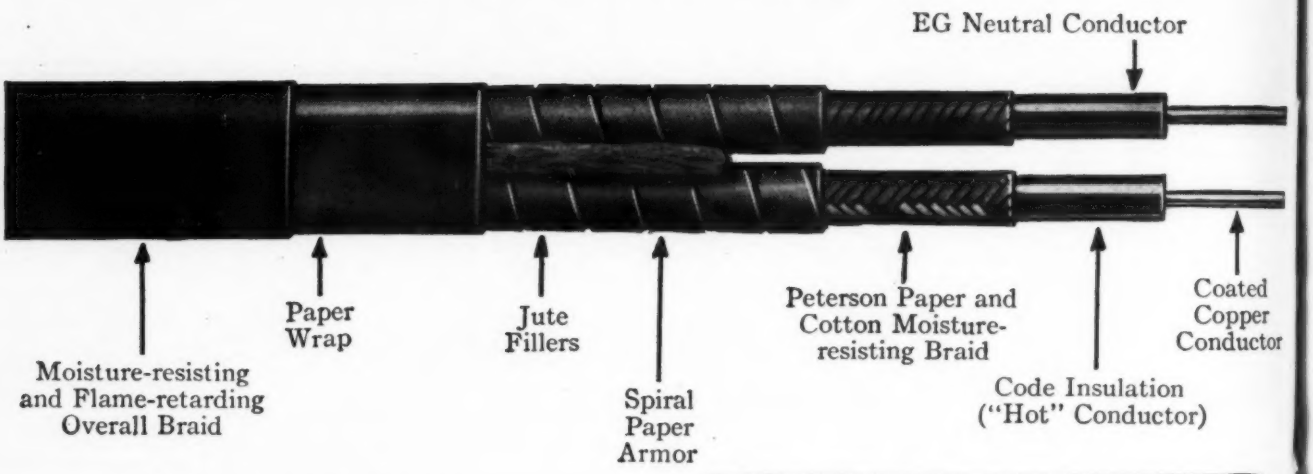

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Here is a high quality, non-metallic sheathed cable that will help keep your plant wiring adequate for wartime loads. Moreover, its use saves steel for the war effort. Install it instead of rigid conduit, EMT or BX **except in hazardous or wet locations.**

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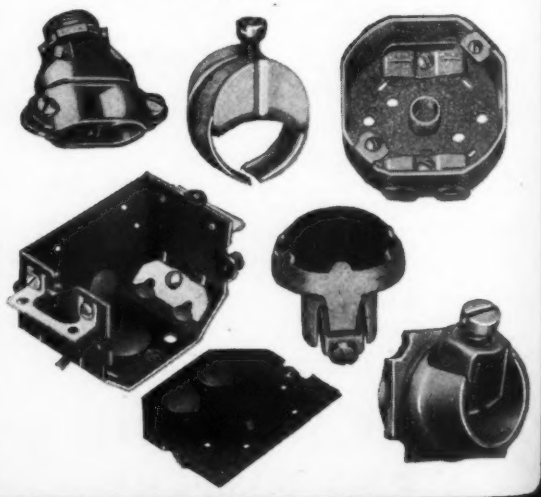
There is a complete line of boxes and fittings to use with G-E BraidX. Only a few are shown here.



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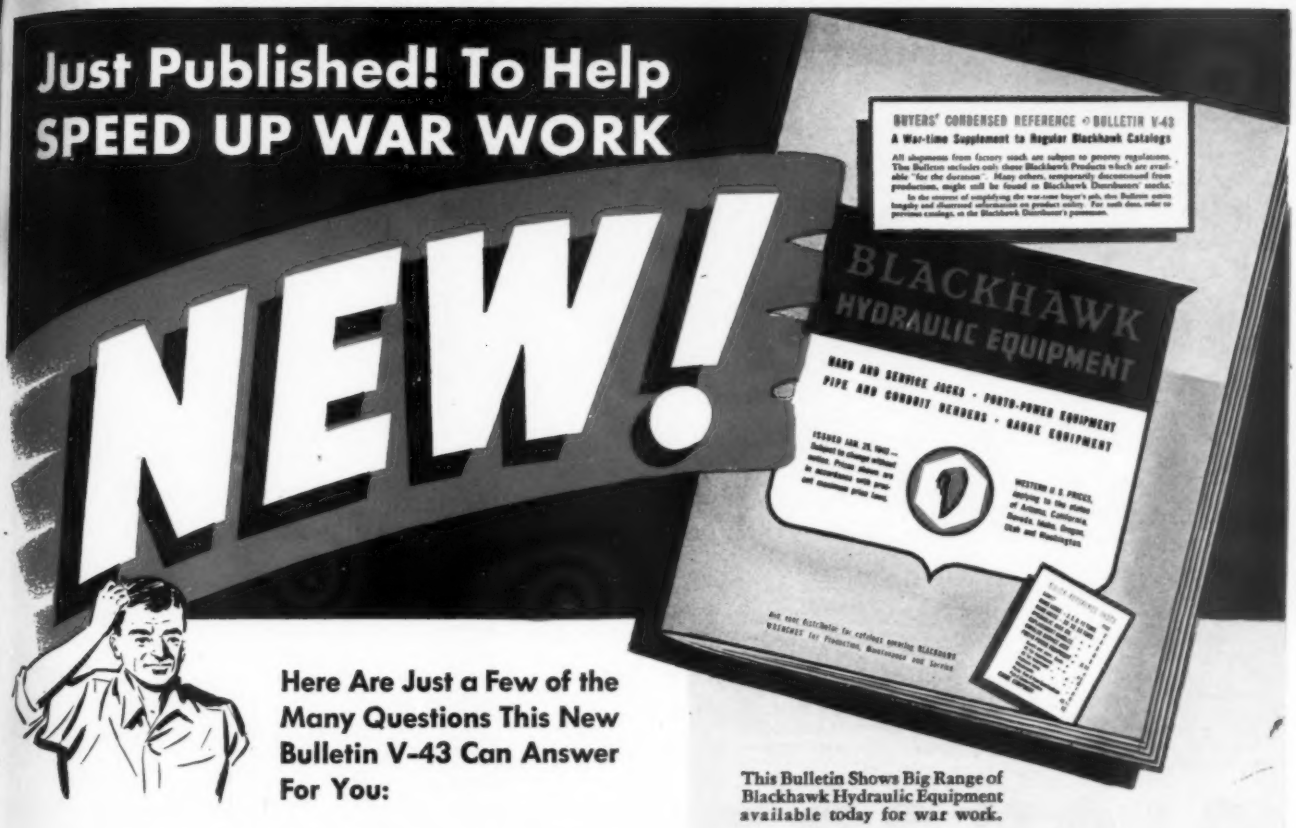
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HAND AND SERVICE JACKS · PORTO-POWER EQUIPMENT
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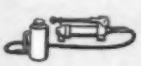

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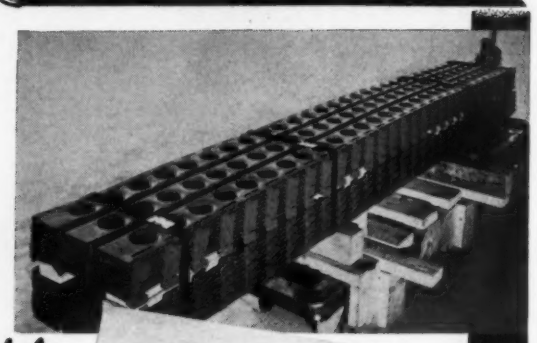

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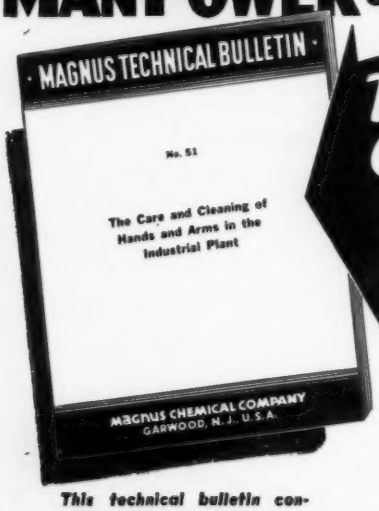
MAGNUS TECHNICAL BULLETIN
No. 51
The Care and Cleaning of Hands and Arms in the Industrial Plant
MAGNUS CHEMICAL COMPANY
GARWOOD, N. J., U. S. A.

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This technical bulletin contains data that will help you solve your manpower problem.

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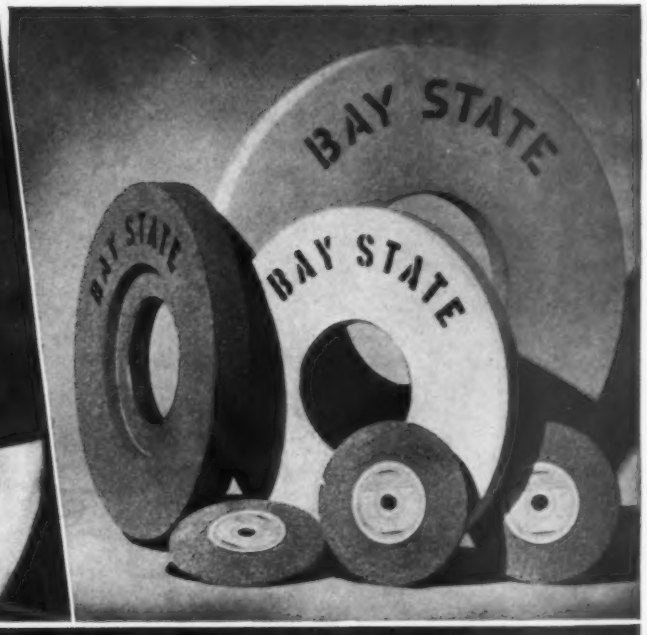

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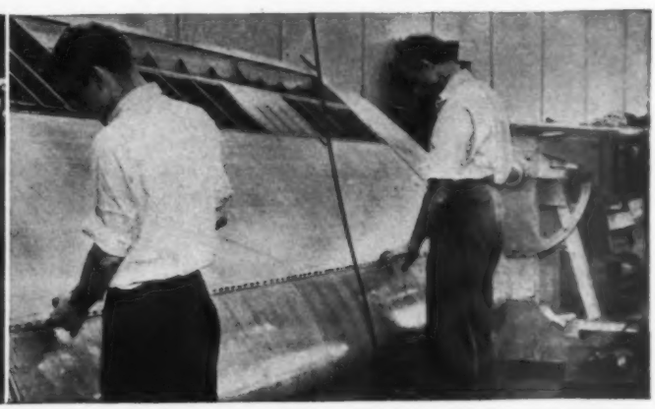
Cleco Sheet Holders being used on a Nose Web

Cleco Sheet Holders on a Fuselage Assembly in Jig



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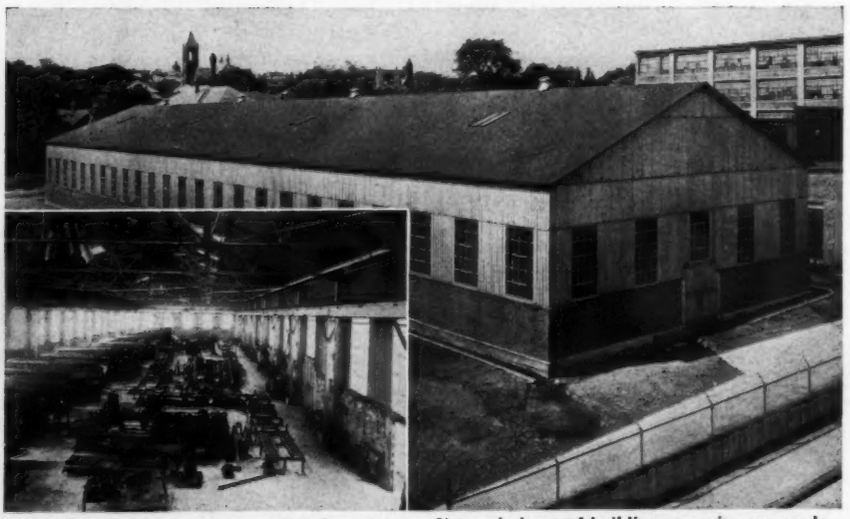

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1. WAS THE OLD MAN burned up? Remember that Acme order? 5 days behind schedule! He stomped in wanting to know why and then he yells, "Don't tell me. I'm going to get to the bottom of this BLANKETY BLANK business myself."

2. HE GOES TO Planning and they alibi that Receiving didn't have materials on time—so he storms into Receiving and finds the stuff was there TWO DAYS before receiving and inspection reports could be made out.

3. NEXT HE CHECKED Production and it was like this — the move order was lost and before anybody caught it and could check on it the job was sidetracked and delayed 24 hours while it was being rescheduled.

4. THEN AT ASSEMBLY he found TWO MORE DAYS lost because one little gadget wasn't through on time. The production order was illegible, "8,000" parts was misread "3,000," so 5,000 pieces hadn't been made.

5. "5 DAYS LOST on this order because we can't get receiving reports on time, move orders are lost and production orders are illegible" he yelled, and I thought he'd bust an artery. Then he quiets down and tells me he wants the answers and wants 'em *quick!* Was I worried and then . . .

"I FOUND THE ANSWER IN STANDARD'S FREE BOOK"

For 30 years The Standard Register Company has been specializing on the problems that today are driving plant and office men to distraction, and it's all in this book. How to step up the flow of paper work as much as 50%. How to keep production moving by keeping production *detail* under perfect control. How to cut red tape and streamline paperwork. How to get more accurate, readable records. How to make one form do the work of two or more. How to save typewriters. How to simplify, systematize, and *control* war production through better, faster ways of handling all production records, orders and reports. How to get these better results with today's "green" clerical help.

You'll find it all in Standard's new 28-page illustrated book called "WHAT'S THE ANSWER?" Use the coupon today.

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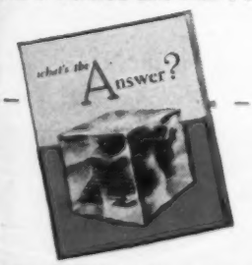
of Industrial Control



Standard is the ORIGINATOR, in continuous business forms, of these distinctive marginally punched holes. They are Marks of Identity of the continuous forms of The Standard Register Company—"the Forms with the Punch."

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301 Albany St., Dayton, Ohio

Gentlemen: Send me at once a copy of "What's The Answer?" containing full information on what you can do *at once* to end "paper-shuffling" so that war production rolls smoother and faster.

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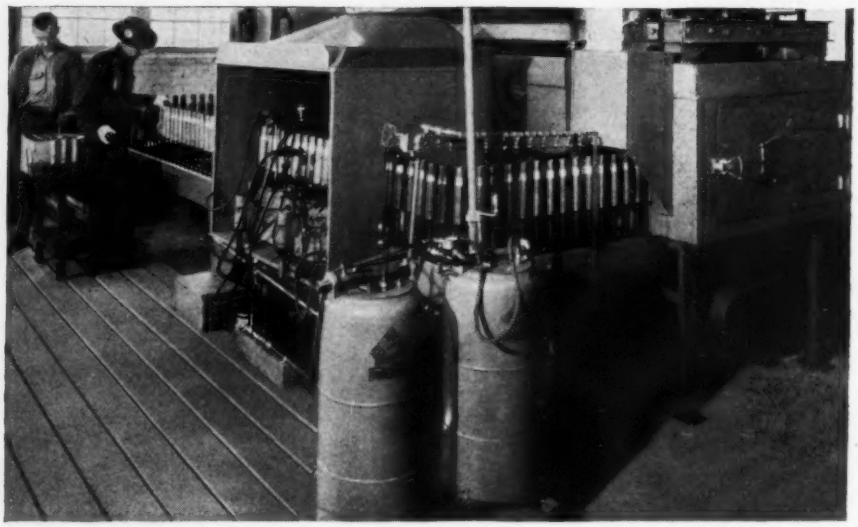
Perfect Coating on 998 out of 1000 Steel Shell Cases

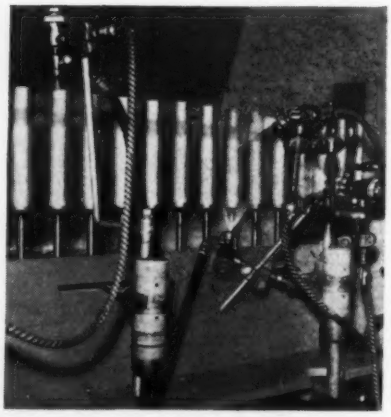


Paasche Automatic Equipment Licks a Tough Finishing Problem

War Department specifications No. AXS-736 allow only 0.0001 plus or minus tolerance on the film thickness of the coating applied to steel shell cases. Airpainting equipment geared to mass production was required for the job. Shown above is the operation in one large war plant, where a Paasche airpainting unit automatically coats the interior and exterior of these steel shell cases. The finish applied is so uniform in thickness and perfect in quality that an average of 998 out of every 1,000 cases are declared O.K. and pass rigid inspection.

Paasche was prepared to meet the exacting specifications for this job because the organization has pioneered the development and refinement of precision-control application. Some of the first shells used against the Axis in this war were coated on Paasche automatic units. While your product requirements may not be so exacting, the same kind of precision automatic painting or coating equipment is available or can be developed, to speed your production, improve quality, and conserve finishing materials. Paasche engineers are at your service.

Further information about Paasche automatic equipment is included in Bulletin F3-42. Write for your copy and complete information.



Paasche spray gun at left coats inside of shell case. Three guns at right coat outside. Guns follow piece while spraying.

Paasche Airbrush Co. 1944 Diversey Parkway, Chicago, Illinois

Manufacturers of Airbrushes, Automatic Airpainting Equipment, Booths, Pressure Regulators, Airconditioners for Compressed Airlines, Airguns & Stripers.

Paasche AIRPAINTING EQUIPMENT

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WORLD'S LARGEST WATER SOFTENERS

Refinite facilities are devoted almost entirely to war work, building water conditioning units to meet every conceivable water problem. Refinite recently completed installation of the plant diagrammed above—26 steel softener tanks, 9 and 10 feet in diameter, with a daily capacity of 9,000,000 gallons of zero-hardness water.

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THE REFINITE CORPORATION

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● Manufacturers of all types of War Products are finding Lyon Shop Equipment and Lyon Storage Equipment major aids in getting the most production out of available "manpower". These industry - proved units speed up the handling of tools and parts . . . save floor space . . . reduce fire and accident hazards. Their design and construction reflects Lyon's half century of experience in *engineering* shop equipment and storage facilities for America's leading industries. Mail coupon for Catalogs.

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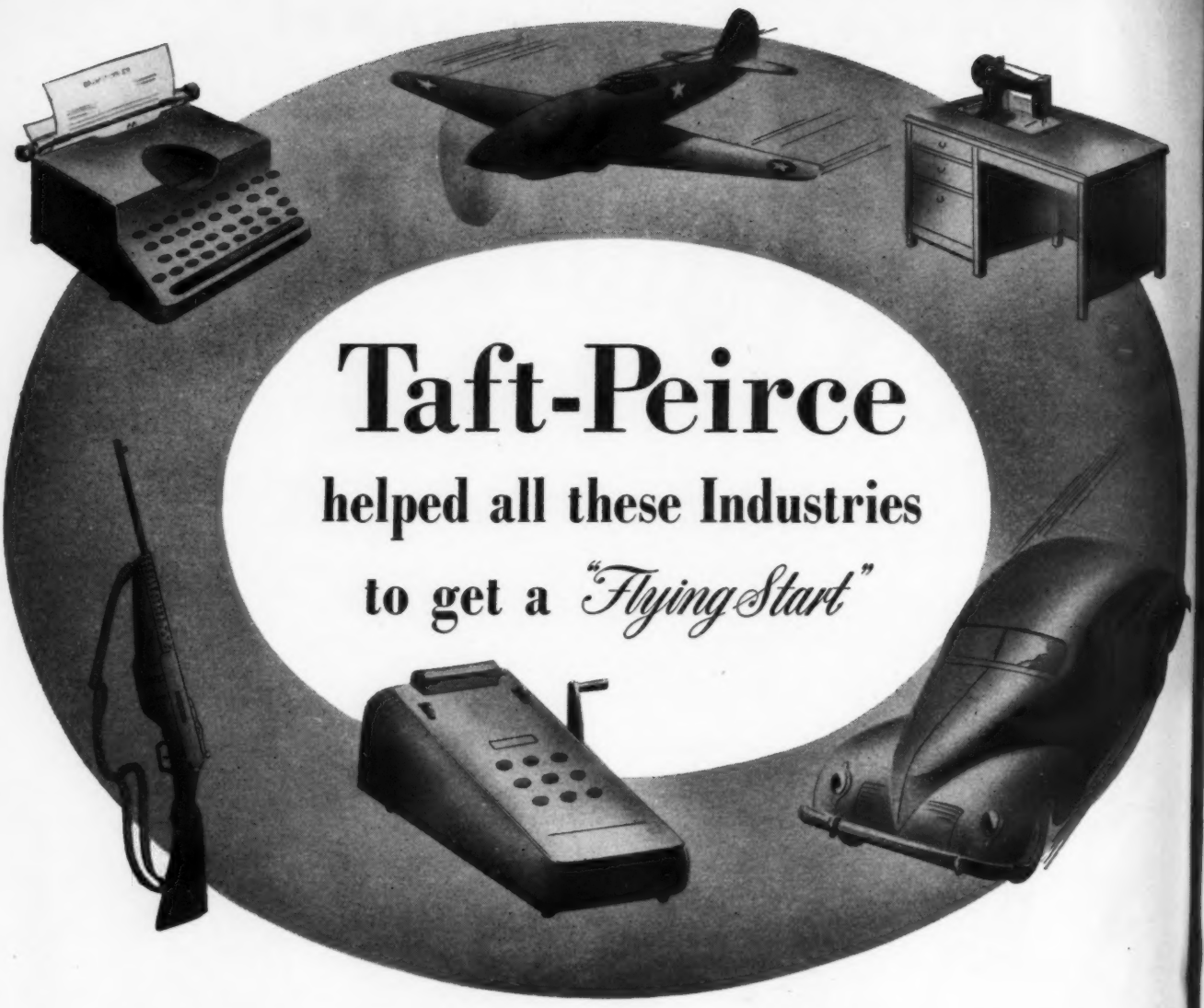

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helped all these Industries to get a *"Flying Start"*

Taft-Peirce engineering and contract manufacturing resources have been called upon to help in the upbringing of many a husky infant industry—not only aviation—but automobiles, typewriters and typesetting machines, sewing machines, accounting and tabulating machines, and automatic weapons.

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As an introduction, we should be glad to send you the interesting picture-and-caption book which shows the kind of men and machines which make up the tightly knit team known as The Taft-Peirce Contract Manufacturing Division. Write to The Taft-Peirce Manufacturing Company, Woonsocket, Rhode Island, for the book which bears as its title the Contract Division's slogan:

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NO ARC BLOW—Because this is an alternating current welding machine, there is no arc blow for the operator to "fight." He makes difficult welds *easier, faster,* and *better.*

SAFE OPEN-CIRCUIT VOLTAGE—Open-circuit voltage is about 70 volts and does not vary more than 2 to 4 volts between maximum and minimum output settings. Potential, however, is adequate to strike and maintain the arc easily.

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OUTPUT CONTROL—Output of the Smith A.C. Arc Welder may be varied *while working* without breaking or altering the fundamental characteristics of the circuit.

SW-15 ELECTRODE—Shielded Arc Universal Type mild steel electrode for flat, fillet, vertical, or overhead welding. While especially suitable for teamwork with the Smith Arc Welder, it also gives excellent results with direct current.
SW-15 is one of the complete line of Smith Certified Welding Electrodes —

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WELDING ELECTRODES *Made by welders... for welders*

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Foxboro Portable Potentiometer Indicators employ the same high-fidelity measuring system as the fixed-service Foxboro Potentiometer Indicators. The accuracy of the potentiometer circuit is unaffected by the resistance of any ordinary thermocouple circuit to which it may be connected. The 17-inch-long temperature scale provides instant, accurate reading and setting. Vernier dial gives quick precision balancing.

Write for Bulletin A-305 containing full details of this and other precision Foxboro Potentiometer Indicators. **The Foxboro Company, 24 Neponset Ave., Foxboro, Mass., U. S. A.** Branch offices in principal cities of the United States and Canada.

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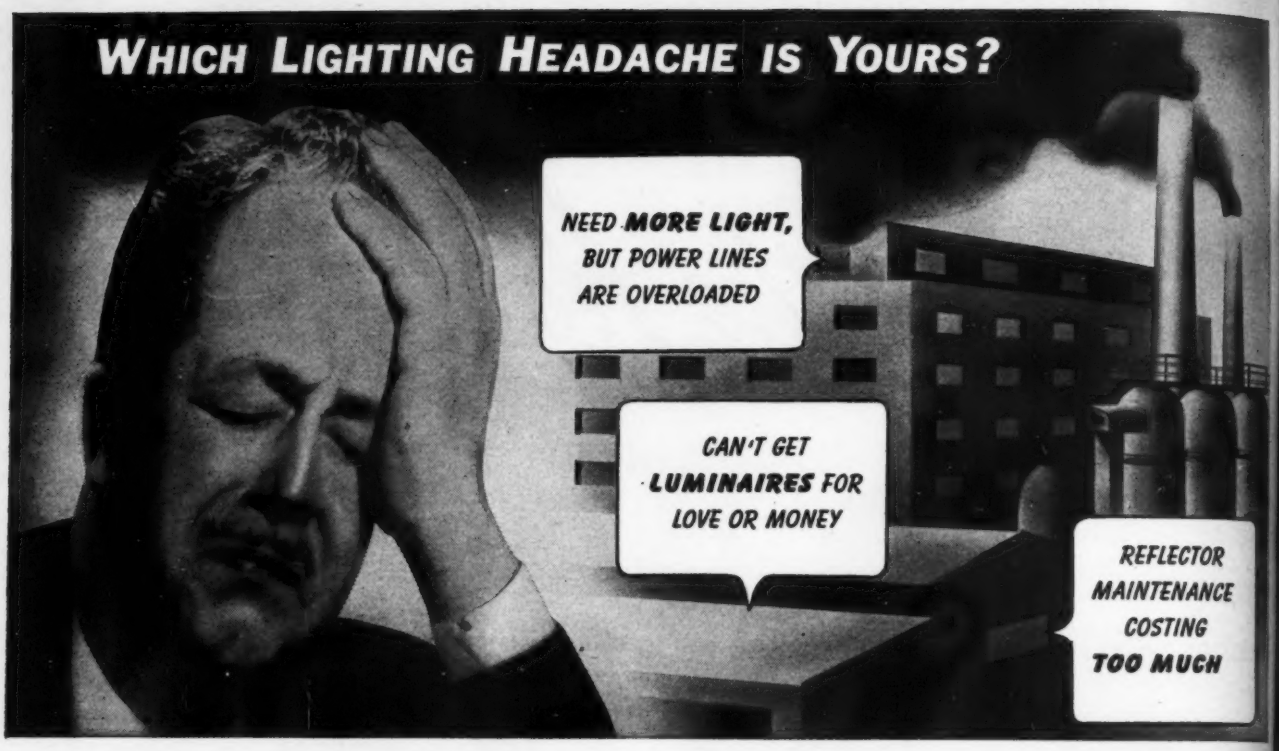
WHICH LIGHTING HEADACHE IS YOURS?
NEED MORE LIGHT, BUT POWER LINES ARE OVERLOADED
CAN'T GET LUMINAIRES FOR LOVE OR MONEY
REFLECTOR MAINTENANCE COSTING TOO MUCH

These Lighting Problems
NOW SOLVED!

CLARENCE BIRDSEYE, famous inventor of quick-frozen foods, has triumphed again! The latest product of his genius is a better kind of *lighting* for industry . . . revolutionary in its efficiency and economy.

Birdseye believed that lamp and luminaire should be ONE. In place of bulbs with separate fixtures, he visualized and created a lamp *with its own perfect reflector* sealed inside the bulb itself . . . precision-focused for accurate light control . . . requiring no fixtures or maintenance . . . providing scientific illumination at the cost of bulbs alone. This is the Birdseye Reflector Lamp.

Users of Birdseye Reflector Lamps read like a "Who's Who" of American industry. Allis-Chalmers, Bliss & Laughlin, Curtiss-Wright, Delco - Remy, General Motors, Johns-Manville, Republic Steel, A. O. Smith, Vultee Aircraft, Willys-Overland — to name just a few—have adopted Birdseyes after exhaustive tests in use. Birdseyes may be the solution to *your* lighting problem. For full details write today for Booklet L3 .

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NO REFLECTORS NEEDED

Birdseye is a complete luminaire lighting unit in itself with its own reflector built into the bulb . . . the perfect, scientific combination of lamp and reflector.

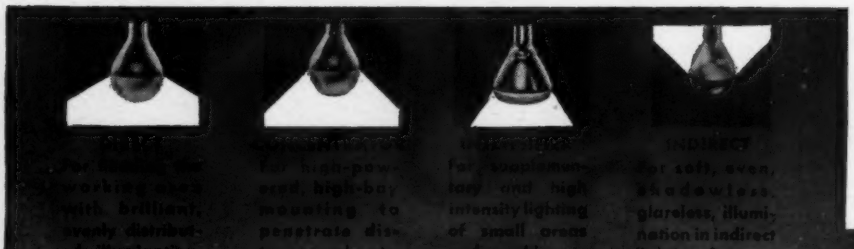
DELIVERS MORE LIGHT PER WATT

Nothing yet designed equals Birdseyes for projecting light down to the working area, full force, without waste. Birdseye's perfect reflector and precision-focused filament do the job scientifically.

SAVES EXPENSIVE MAINTENANCE

Birdseye's pure silver reflector lining is *sealed inside* where dust, dirt, smoke can never reach it. Thus Birdseye reflectors never need cleaning. An important saving especially in high bay mounts.

★ BIRDSEYE ★



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indicate a better design . . . permit installation in smaller spaces. Available in four sizes . . . 1.5 to 7.5 H.P. . . . 110 to 550 volts (A.C.) . . . all fully approved by Underwriters' Laboratory.

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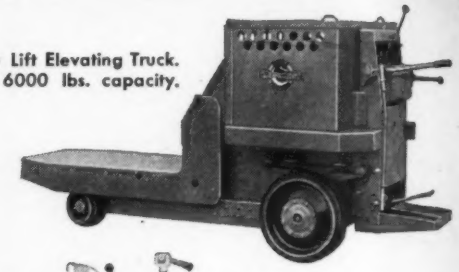
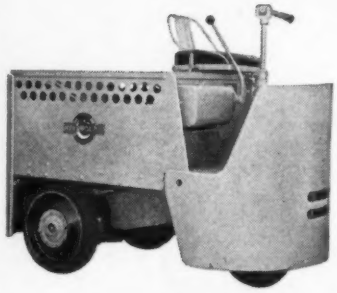
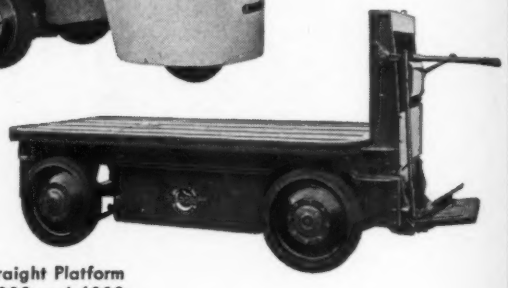


NDRE—Low Lift Elevating Truck. 4000 and 6000 lbs. capacity.

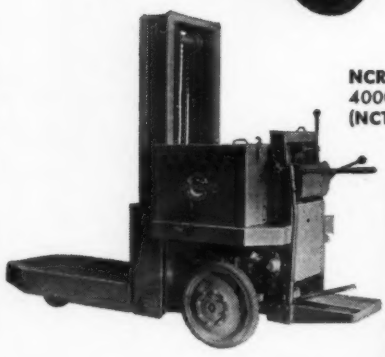


NTW—Twin Front Wheel Heavy Duty All-Purpose Tractor.

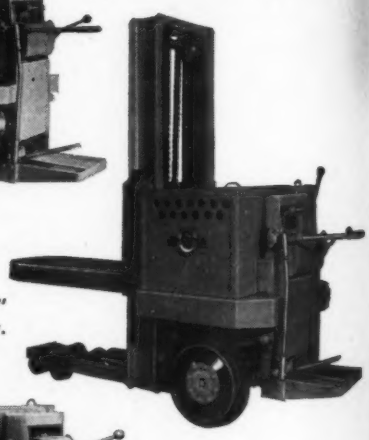


NA—Straight Platform Truck. 4000 and 6000 lbs. capacity.

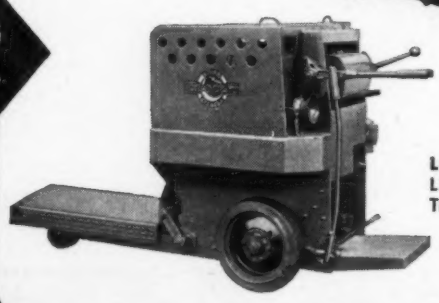
NBR—Drop Frame Load Carrying Truck. 4000 and 6000 lbs. capacity.



NCRE—High Lift or Tiering Truck. 4000 and 6000 lbs. capacity. (**NCTE**—10,000 lbs. capacity.)



NCDE—High Lift Truck for 8" skids. 4-5000 lbs. capacity.



LO-LIF-TOER (LDLF)—Foot Lift Elevating Platform Truck. 3000 lbs. capacity.

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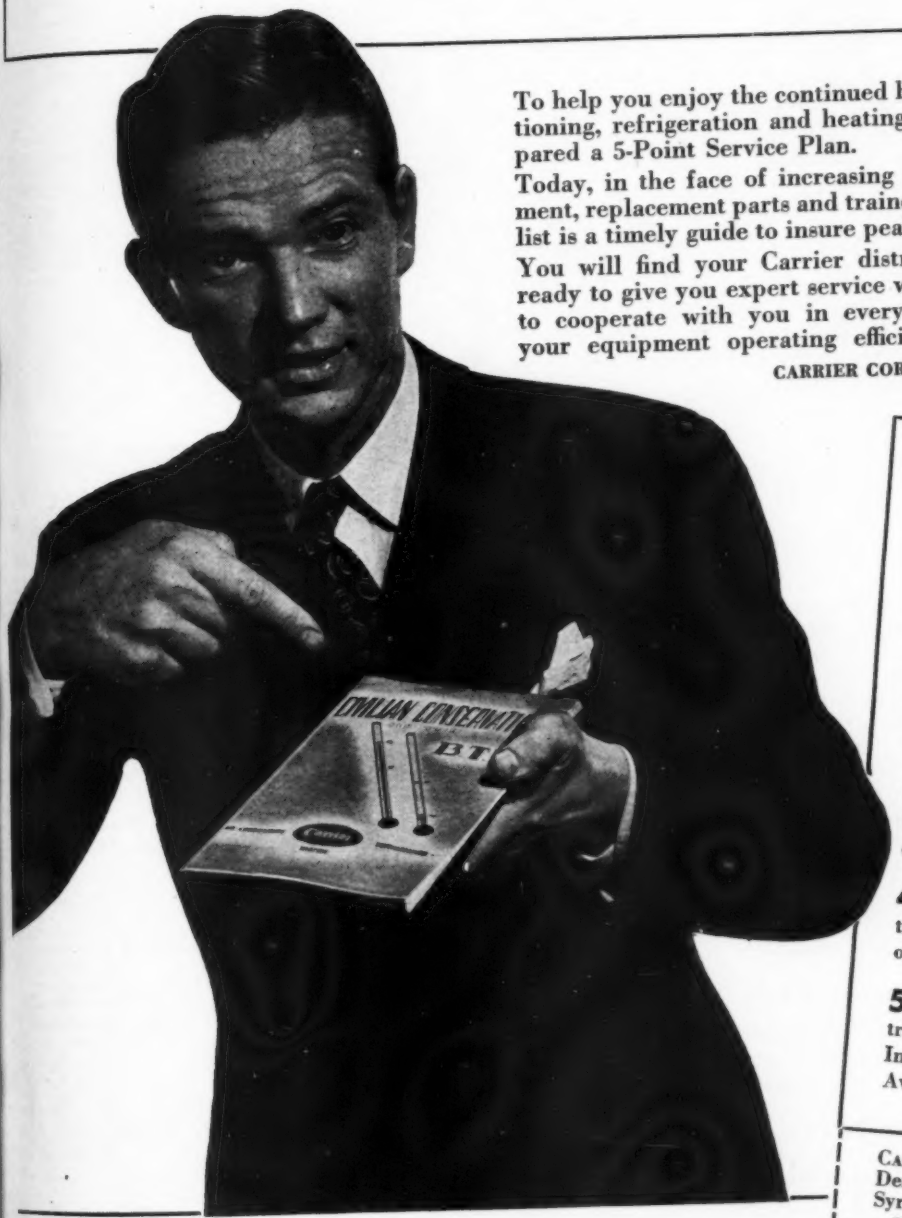

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Today, in the face of increasing shortages of such equipment, replacement parts and trained service men, this check list is a timely guide to insure peak operating performance.

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CARRIER CORPORATION, SYRACUSE, N. Y.

5-Point Service Program

1. Make Maintenance of Equipment the Responsibility of a Capable Employee.
2. Make Regular Monthly Inspection of all Equipment. See that it is Properly Lubricated.
3. Keep Equipment Free of Dust and Dirt and Check Frequently for Refrigerant Leaks.
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5. Have Nearest Carrier Distributor Inspect Installation to Insure Satisfactory Operation and Avoid Expensive Repairs.

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- Always ready for use

Foille's enviable record in industry, as *the* modern treatment for burns, is founded on definite results. Foille shortens the recovery-time of burn victims, saves man-hours for production. Foille is applied directly to the injury—nothing to mix or prepare—and does not require removal by the physician when treatment is continued. Light in consistency, free-flowing, Foille may be applied by sponge, brush or spray gun; is furnished in tubes and bottles for first aid kits, and bulk containers for hospital service. Write for the facts!

MSA FOILLE BURN KIT
FOR RAPID EMERGENCY USE

Contains a liberal supply of Foille for Burns, in jars which connect direct to efficient spray gun* for fast application—together with unit-packaged First Aid dressings and accessories, including sterilized muslin sheet. Strongly-cased for long service. Bulletin No. FA-73.

*When the spray gun (employing critical materials) is no longer available, these kits will be equipped with three 1⅜" camels' hair brushes for speedy application of Foille. Spray guns will again be included when available.

MINE SAFETY APPLIANCES COMPANY
BRADDOCK, THOMAS AND MEADE STREETS
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Filtrine WATER FILTERS

Insure Water Line Precision

Crystal clear water may be rare, especially today when most sources are being severely drained. But your water supply for drinking and industrial purposes will be the way you want it . . . will never vary . . . if you use FILTRINE FILTERS.

Filtrine removes *completely* rust, sand, clay and vegetable matter from water, and lasts a lifetime. Its filter medium, when saturated, can be replaced in two minutes. Guarantee that your water will be in step with the precision of your production line by installing FILTRINE FILTERS now.

Use FILTRINE Storage Type COOLERS, too, to insure a constant supply of cooled water. Self-contained coolers, remote type coolers for drinking water and coolers for general industrial use are available in a variety of models.

Write today for further information

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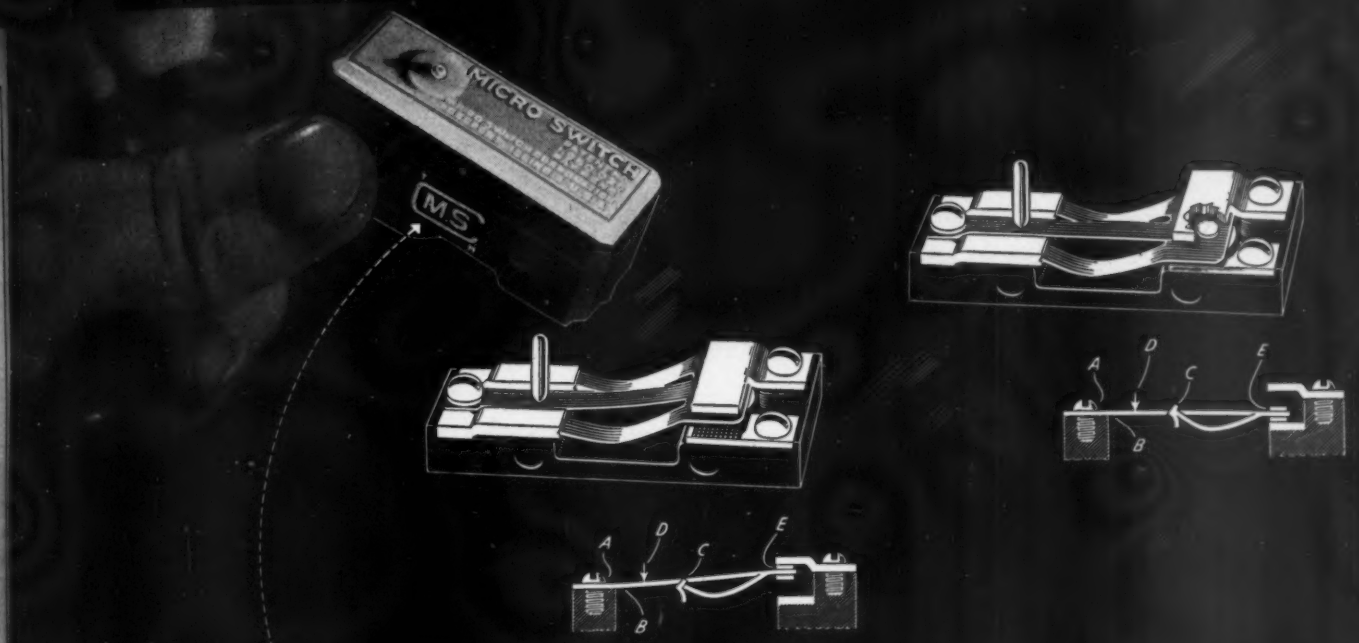


Without This Mark MS It Isn't a Micro Switch

There is only one micro switch—the MICRO SWITCH—manufactured by this company. When you buy a precision snap-action switch, it is not a MICRO SWITCH unless it has the now familiar trademark shown on the side of the switch as illustrated above.

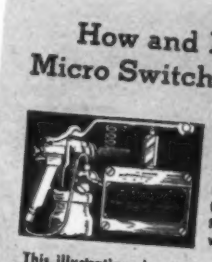
The MICRO SWITCH is thumb-size, feather-light, and operates precisely at the same point for millions of operations with lightning-fast contact action. It is accurately built to exact standards from precisely made parts. Its performance characteristics can be changed to meet functional requirements. It can be furnished with many types of actuating mechanisms and protective housings.

The MICRO SWITCH is the only precision snap-action switch available to you which employs the principles of design illustrated above and described below.

The MICRO SWITCH principle is different. It involves no reverse bends—no buckling "oilcan" action. The long member of the one piece, three bladed, beryllium copper leaf spring "B" is supported in cantilever at "A". The two short members are curved in compression to rest in the notches at "C." These two strut-like springs exert an upward force to hold the electrical contacts "E" together with a force of 40 to 100 grams, depending on the type of switch. The operating force applied at "D" deflects the longer tension member downward in a gentle curve until the upward force of the bowed members is overcome and the contact end of the spring moves downward with the sharp, snap-action which makes clean cut electrical switching. The distance the contacts are separated is controlled to suit the particular problem at hand, and may be as much as .070 inches for high altitude aircraft use. Removal of the force at "D" allows equally fast snap-return to the original position... The electrical contact moves in the same direction as the operating force. This direct action not only provides accurate performance, time after time, for millions of operations, but should there be a welding or sticking of contacts due to overload, the direct-acting force acts as insurance to break the weld and to put the switch back into service.

On present or future designs it will pay you to consider the many advantages in space saving, accuracy, precision performance, and the dependability of a snap-action switch. But when you do, be sure that you select a MICRO SWITCH for the reasons enumerated above. Shown below are typical applications, and the two catalogs illustrated in the lower left hand corner of these pages will be highly advantageous to you in incorporating the MICRO SWITCH into your design.

How and For What Micro Switches Are Used



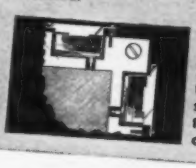
This shows an explosion proof Micro Switch used with a spray gun which automatically cuts out the entire operation of the spraying booth when the gun is shut off.

This illustration shows the Micro Switch with a spring leaf actuator serving as a break indicator as used in textile mills or paper mills.

This illustration shows a Micro Switch enclosed in a die cast housing with a synthetic rubber seal, and is being used as a lathe carriage stop.

This illustration shows a Micro Switch with a pushbutton actuator being used as a safety switch in a high tension cabinet door. It is a normally open switch in which the circuit is opened as the door is opened.

This illustration shows two steel enclosed Micro Switches which serve as overrun limit switches on a machine tool.



This illustration shows the use of two Micro Switches with spring type plungers to insure safe positioning of material in a punch press or a similar tool.

This illustration shows use of a Micro Switch with a spring plunger which is actuated by the pressure of a liquid in a line as the actuating medium.

SEND FOR THESE CATALOGS

Your up-to-the-minute engineers will thank you for keeping them informed about the Micro Switch. Send for as many of the Handbook-Catalogs illustrated here as you think necessary. No. 60 covers Micro Switches in general; and No. 70 deals with specific Micro Switches for use in aircraft.

Switch is a trade name indicating manufacture by Micro Switch Corporation

MICRO MS SWITCH

Manufactured in FREEPORT, Illinois, by Micro Switch Corporation

Branches: 43 East Ohio St., Chicago • 11 Park Place, New York City • Sales and Engineering Offices: Boston, Hartford, [illegible]

IT'S GOT ALMOST EVERYTHING

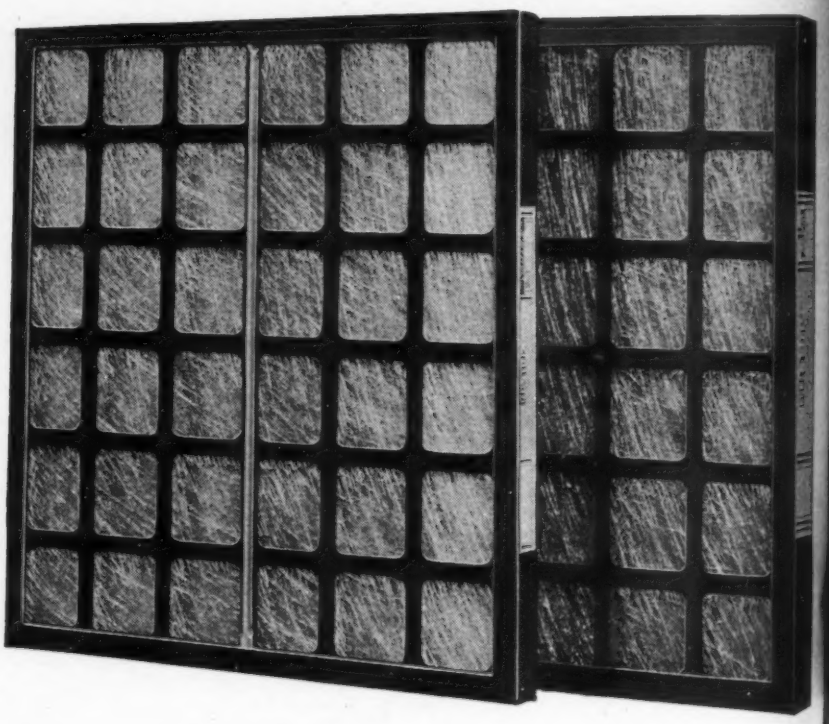
Dust-Stop's new "war filter" retains most advantages of former filter

Precision manufacture means dust control in air-conditioning and mechanical ventilation systems.

To many bomber, tank, instrument, and other war plants—this means Dust-Stops.*

And this increased demand, greater than ever before, has been met by Dust-Stop engineers. On the market now is the new "war filter." Quickly available! Price and maintenance economy unchanged! Same filtering efficiency!

AND IT'S MADE FROM NON-CRITICAL MATERIALS!



Above, the former filter. To right, new "war filter." Square-holed grill of heavy Kraft cardboard replaces metal, round-holed grill.

Look at "war filter's" advantages

PERFORMANCE: Capacity 2 CFM per sq. in. of area at 300 FPM. Average resistance, new, in inches of water gauge, .065 for 1-inch, .13 for 2-inch.

ECONOMY: Cost only 1¢ per CFM as original equipment for industrial installations. Less than 1/10 of 1¢ per CFM to replace.

MAINTENANCE: Filter face can be vacuum cleaned or rapped out; this practice can be repeated once or twice, further reducing maintenance costs.

EASY TO CHANGE: Anyone can replace dirty filters with new Dust-Stops in a jiffy.

AVAILABILITY: Made from all-American materials which are not now listed as critical. Production is being expanded to meet growing requirements.

WHAT ABOUT FIRE-SAFETY?: The famous non-inflammable Dust-Stop adhesive is no longer available. As a substitute, standard filter adhesives are now used. The filter media is still made of incombustible glass fibers.

• • •

Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada, Ltd., Oshawa, Ontario.

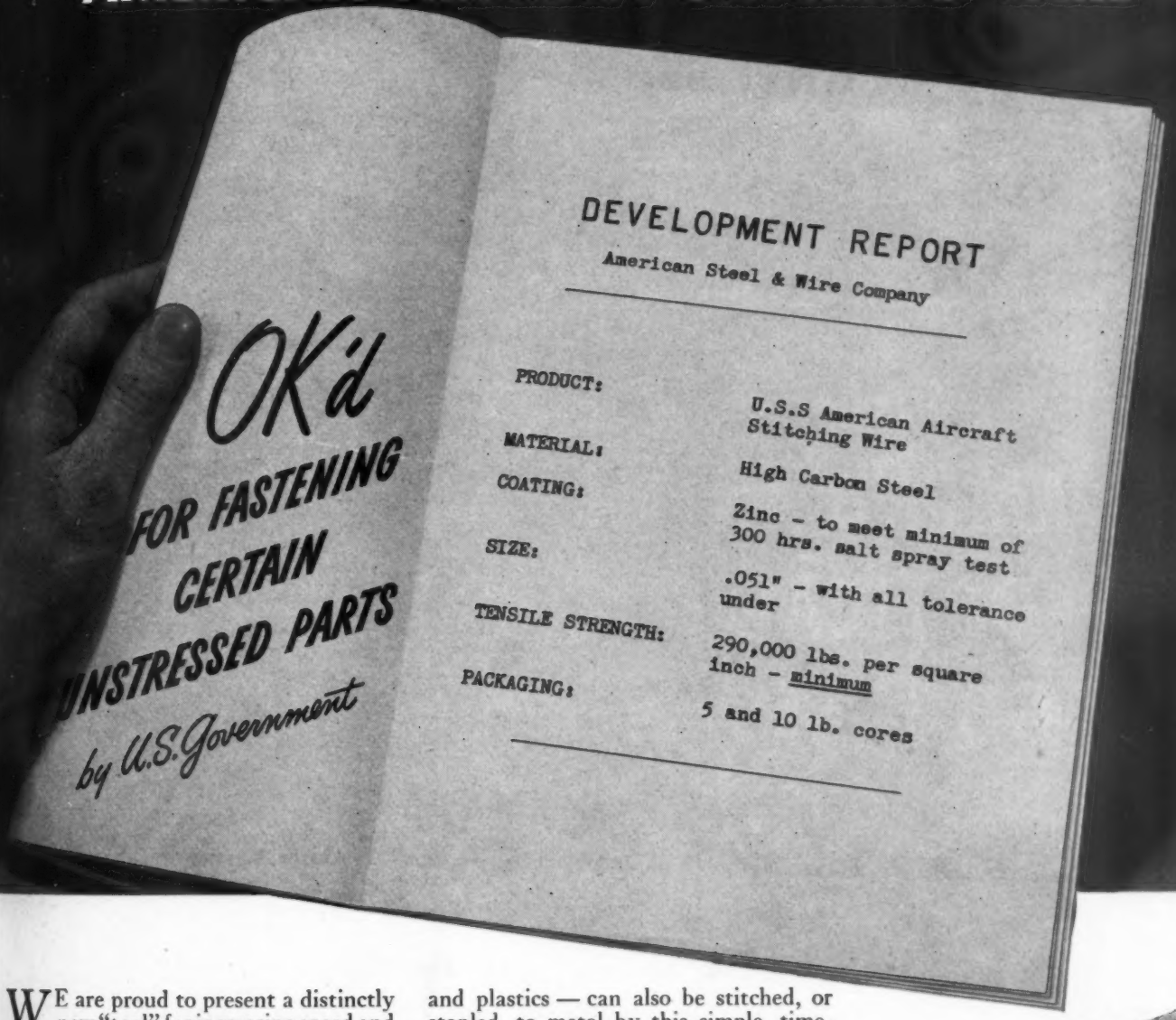
ARMY E NAVY

FIBERGLAS* DUSTOP* AIR FILTERS

*T. M. Reg. U.S. Pat. Off.

Announcing

AMERICAN AIRCRAFT STITCHING WIRE


OK'd
FOR FASTENING
CERTAIN
UNSTRESSED PARTS
by U.S. Government
DEVELOPMENT REPORT
American Steel & Wire Company
PRODUCT: U.S.S American Aircraft Stitching Wire
MATERIAL: High Carbon Steel
COATING: Zinc - to meet minimum of 300 hrs. salt spray test
SIZE: .051" - with all tolerance under
TENSILE STRENGTH: 290,000 lbs. per square inch - minimum
PACKAGING: 5 and 10 lb. cores

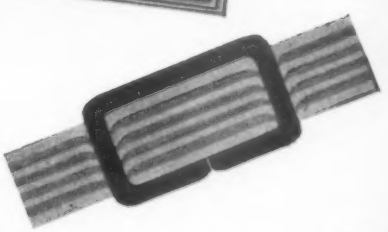
WE are proud to present a distinctly new "tool" for increasing speed and cutting costs on the production front—a new stitching wire developed especially for aircraft manufacturing by which parts such as heat ducts, trailing edge beading, junction boxes, ammunition boxes, ejection chutes and other unstressed units can be more quickly fabricated.

With U·S·S American Aircraft Stitching Wire, stainless steel, carbon steel, aluminum and other metals—in gauges up to .035″ for stainless steel—up to .060″ for SO aluminum, and .040″ for 24 ST aluminum—can be fastened together, at high speed, economically and with unskilled labor.

Other materials—wood, leather, fabric and plastics — can also be stitched, or stapled, to metal by this simple, time-saving means. "Sandwiches" of these materials in steel or aluminum can also be made up to ¾″ thick.

American Aircraft Stitching Wire is heavily coated with a tightly adhering zinc coating which renders it corrosion resistant to a high degree. Samples have come through salt spray tests in excess of 300 hours with flying colors. Staples have been successfully tested both for shearing strength and vibration fatigue.

If you want to save time and conserve strategic materials—this method of fastening certain unstressed airplane or glider parts will be of definite interest to you. We shall be pleased to discuss further details at your convenience.



This section (twice natural size) illustrates the tight corners and full bearing of wire against material made possible by use of AMERICAN AIRCRAFT STITCHING WIRE.

AMERICAN STEEL & WIRE COMPANY

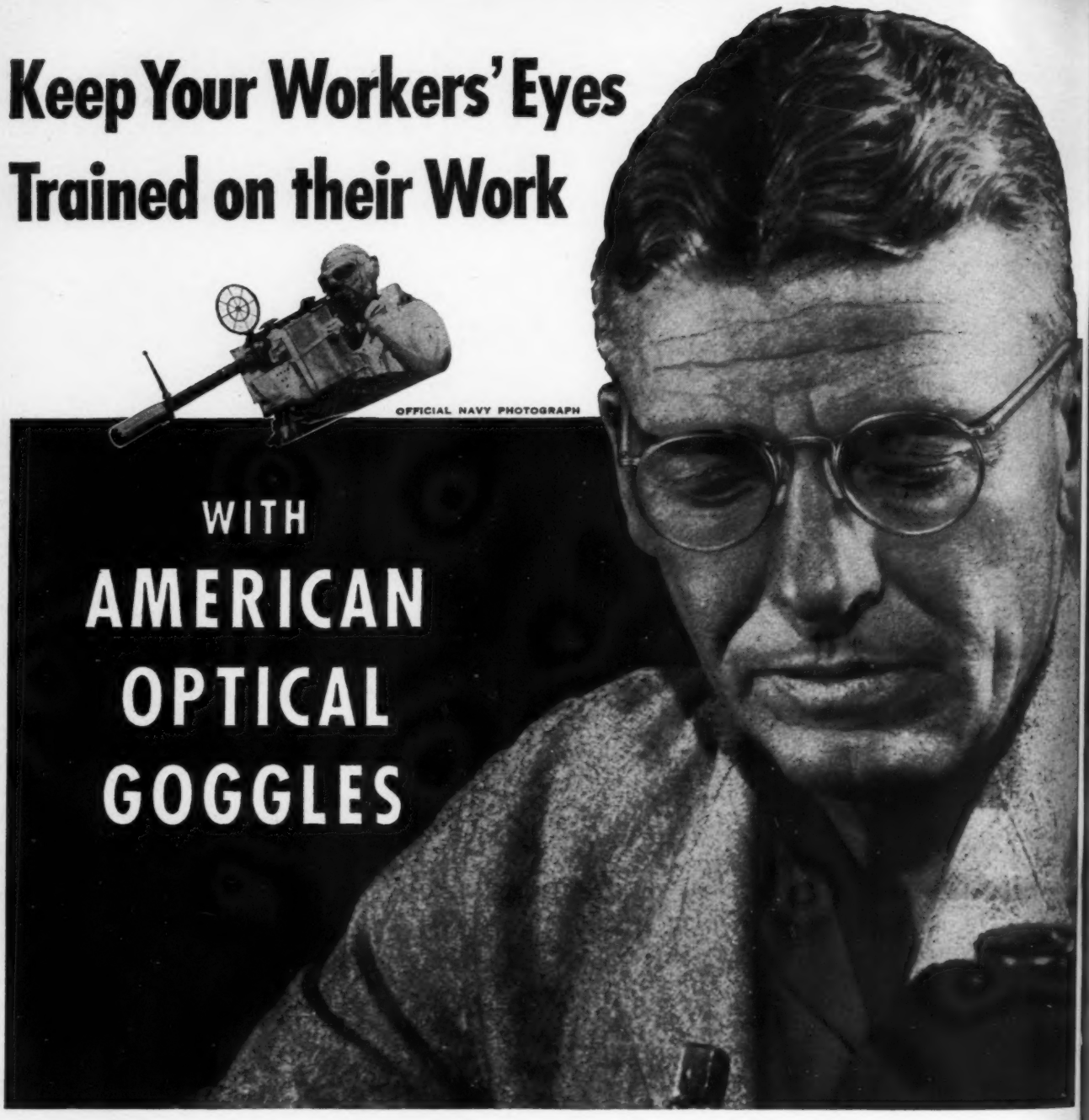
Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL

Keep Your Workers' Eyes Trained on their Work

OFFICIAL NAVY PHOTOGRAPH



WITH AMERICAN OPTICAL GOGGLES

We need more than our workers' hands to win this war . . . we also need their *eyes*. Yet, for lack of proper goggles, industrial eye accidents are *still* occurring at an alarming rate . . . *still* costing our valiant fighting men much equipment that they need to smash the enemy.

Put on an offensive now to stop eye accidents in *your* plant. American Optical Company, pioneer manufacturer of products to aid and preserve vision, offers you the eye protection equipment and complementary services that your plant needs to protect man-power for war-power. AO Goggles are scientifically designed to give maximum possible protection . . . and workers find them comfortable to wear. Have your Safety Director get in touch with the nearest American Optical Branch Office.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

This Year Rubber Is Tapped from Test Tubes

Synthetic Rubber Already Is Working for Users of Mechanical Rubber Goods

War production is up threefold. But the vital rubber stock pile is dwindling fast. This is the year of crisis in rubber.

There is only one solution . . . the production of synthetic rubber in steadily increasing tonnages . . . synthetic rubber to take over jobs once handled by natural rubber . . . to perform new tasks, serve in new applications created by wartime need.

One of the first synthetic rubber plants in the Government's program was built and is being operated by United States Rubber Company . . . another soon will be in production.

Our engineers have been working with synthetic rubber since 1921. During this period they have learned that no one synthetic should be used for all types of mechanical rubber goods. They have found where and how synthetic is superior to natural rubber, where it is equally as good, where it falls short. They know what uses each of the five basic commercial types of synthetic rubber is best suited for — Neoprene, Buna-S, Buna-N, Butyl, or Thiokol—and how to compound the specific synthetic rubber for the specific task. U. S. Rubber has used all five types and knows which one to select for the performance required.

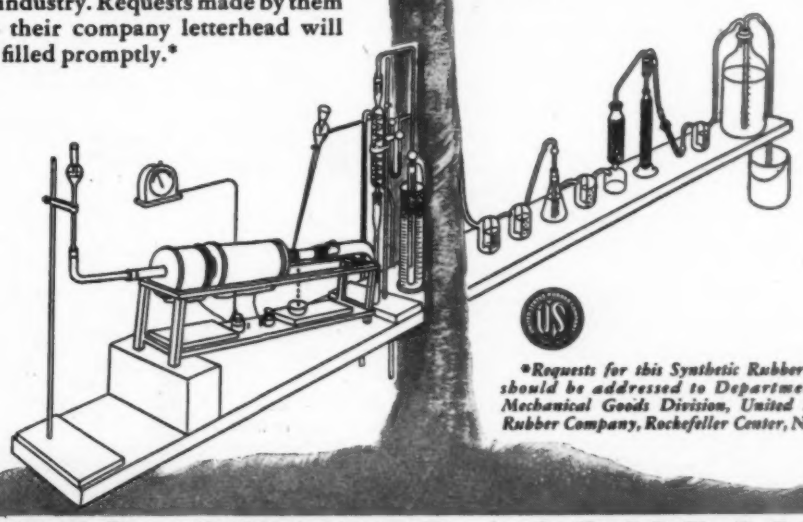
Information based on the results of vast experiments and practical applications of synthetic rubber has been incorporated in a new comprehensive book, *The Five Commercial Types of Synthetic Rubber.*

This informative book traces the history of synthetic rubber from the earliest experiments of Michael Faraday to the present. It discusses each of the basic types of synthetic rubber, tells where it has been used successfully in United States Rubber Company products, and compares its properties with natural rubber. It tells how synthetic rubber is made. It is a detailed answer to the most vital question of the day.

We feel that *The Five Commercial Types of Synthetic Rubber* is a publication of real importance to men of industry. Requests made by them on their company letterhead will be filled promptly.*

The successful use of synthetic rubber in mechanical rubber goods and the insurance of fully dependable service depend largely upon the skill of the manufacturer and compounder. Each of the five basic commercial types of synthetic permits a myriad of variations.

The United States Rubber Company has been developing and improving rubber products for one hundred years. Today, the same vast resources for research and development that resulted in some of the most spectacular achievements in the rubber industry are being devoted to the problem of synthetic rubber. A great backlog of knowledge already has been built. More is being constantly added.



**Requests for this Synthetic Rubber Book should be addressed to Department [2] Mechanical Goods Division, United States Rubber Company, Rockefeller Center, N. Y. C.*

UNITED STATES RUBBER COMPANY

Mechanical Rubber Goods Division • Rockefeller Center • New York

In Canada, **Dominion Rubber Co., Ltd.**

FASTER—SIMPLIFIED *Dy-namic* BALANCING!

100 Dy-namically Balanced per Day
is this operator's performance, as reported by a manufacturer of radio communication generators. Operator had no previous experience and but three hours instruction.
REDUCE WEAR
ELIMINATE NOISE
CUT VIBRATION
IMPROVE EFFICIENCY

NEW AID TO WAR PRODUCTION
Solves Vibration and Manpower Problems

New—but already Bear Dy-namic balancing machines are in successful operation on many industrial fronts. Manufacturers of fans, blowers, motors, crankshafts and other rotating bodies, as well as maintenance departments charged with the repair of such bodies, report that these inexpensive machines represent a distinct advance in fast, simplified and accurate dy-namic balancing.

These machines provide for testing and a static and dy-namic balancing of rotating bodies in one continuous operation that meets all established requirements including government specifications for dy-namic balance. Solves Skilled Manpower problem, as almost any employee can be quickly instructed in their operation.

Bear machines are made in many sizes and types, ranging from bench models as illustrated above to large heavy-duty floor and pit models.

Engineering counsel is at your service. Write, wire or phone details of your problem or write for the free Data Booklet. Address Bear Mfg. Co., Dept. FM, Industrial Division, Rock Island, Illinois.

BEAR

STATIC AND DY-NAMIC BALANCING MACHINES

DAY after DAY
NIGHT after NIGHT
HOUR after HOUR

THIS 18" BALL BEARING DRILL PRESS WILL PERSISTENTLY PERSIST IN DELIVERING

MAXIMUM { OUTPUT • EFFICIENCY WITH GREATEST EASE OF OPERATION

Get all the facts to-day

DURO METAL PRODUCTS CO.
DEPT F8 2649 N. KILDARE CHICAGO, ILL.

DURO FOR DUBABILITY

DO YOU USE SAWS?
— to slot commutator risers? — to undercut mica? — to slit metal or other materials?
Write for stock list of standard sizes. Special sizes and types made for your particular cutting problem.
SAWS
Eymon-Dakin Co.
6434 Cass Ave.
DETROIT - MICHIGAN

SERVING THE WAR INDUSTRIES

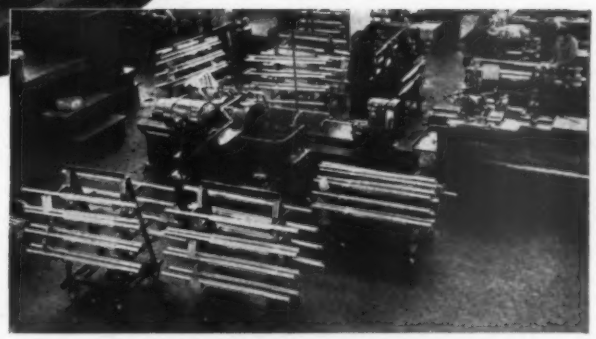
Finnell

COMBINATION SCRUBBER

It speeds the cleaning of large-area floors in war-busy plants and places as only this *complete cleaning unit* can . . . not only providing safer floors for workers but contributing to the war effort in these many other important ways:

A *Finnell Scrubber-Rinser-Drier* solves the problem of cleaning floors of plants on round-the-clock schedules, where the job must be done while production is in progress . . . speedily . . . without muss and disturbance! It speeds the necessarily more frequent cleaning of white floors, designed to aid better lighting. And it conserves man-power by requiring just one operator for the scrubbing, rinsing, and drying operations. As a matter of fact, the *all-in-one feature* and the speed of the machine—8,750 sq. ft. per hour using the largest size!—make it easy for one operator to clean, hour for hour, many times the floor area possible with other methods and more operators.

For FREE FLOOR SURVEY, consultation, or literature showing the full range of *Finnell Combination Scrubbers*, phone or write nearest *Finnell* branch or Finnell System, Inc., 2503 East Street, Elkhart, Indiana.



ARMAMENT PLANTS

Courtesy, Douglas Aircraft

AIRPLANE PLANTS

Courtesy, Pan American Airways System

AIR TRANSPORTATION

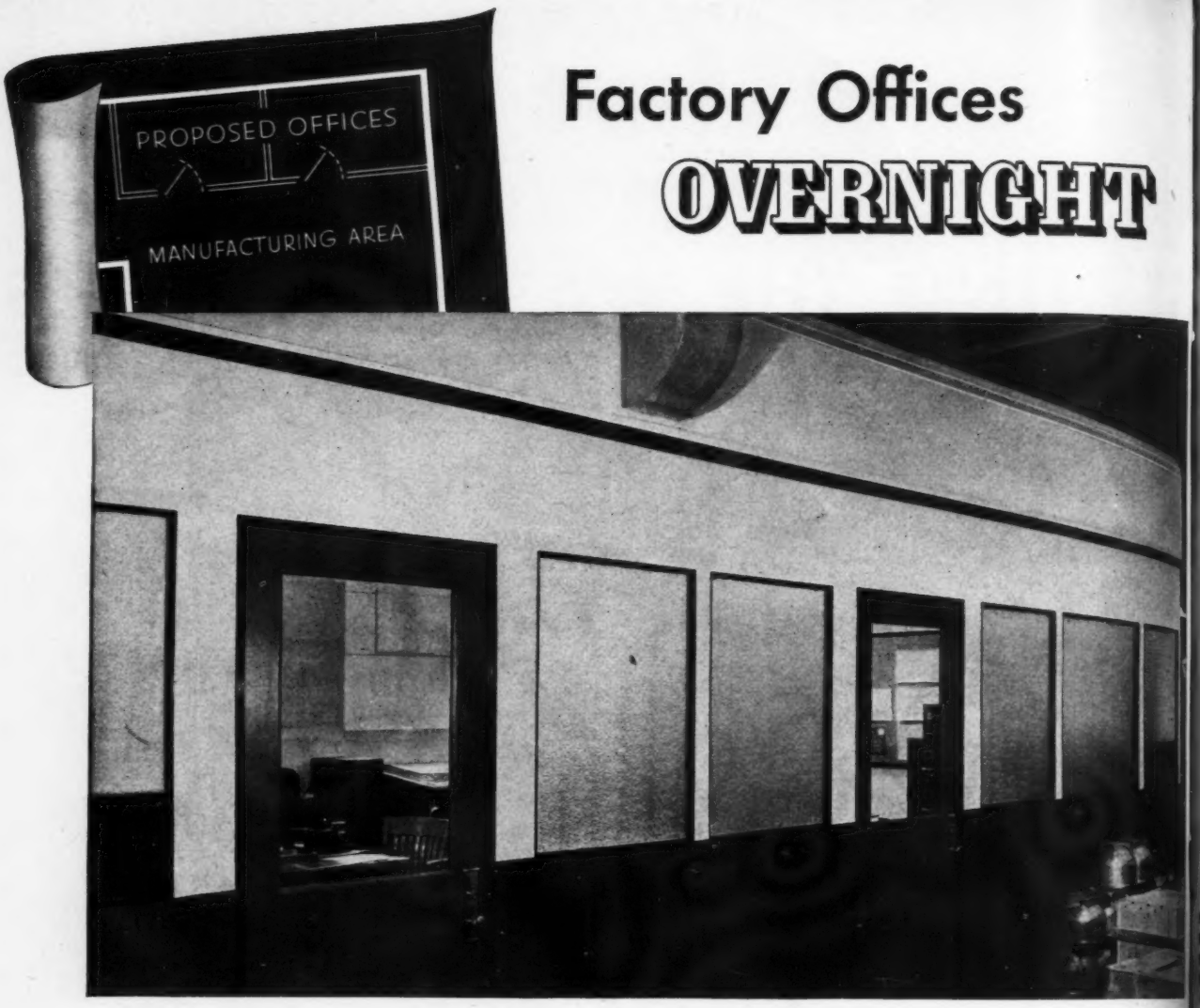
FINNELL SYSTEM, INC.

Pioneers and Specialists in

FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

BRANCHES IN ALL PRINCIPAL CITIES

Factory Offices OVERNIGHT



...with these modern movable partitions!

RUSH JOBS in plant office construction call for Johns-Manville Transite Walls. These modern movable partitions permit offices to be erected almost *overnight* . . . yet provide sturdiness and complete privacy . . . They require little if any upkeep and are economical in price. Consider these other advantages:

100% SALVAGE if relocation is necessary. The use of interchangeable parts assures maximum re-use of all materials.

VIRTUALLY ABUSE-PROOF. Transite Walls made of asbestos and cement are highly resistant to shock and impact, and provide a complete wall panel of exceptional durability.

PLEASING APPEARANCE. Perfect for plant or general office use because of their modern lines and flush streamlined appearance. Color is light gray—can be painted if desired. Permanent finish.

FORMS ANY TYPE PARTITION. Solid or in combination with glass—ceiling-high or free-standing.

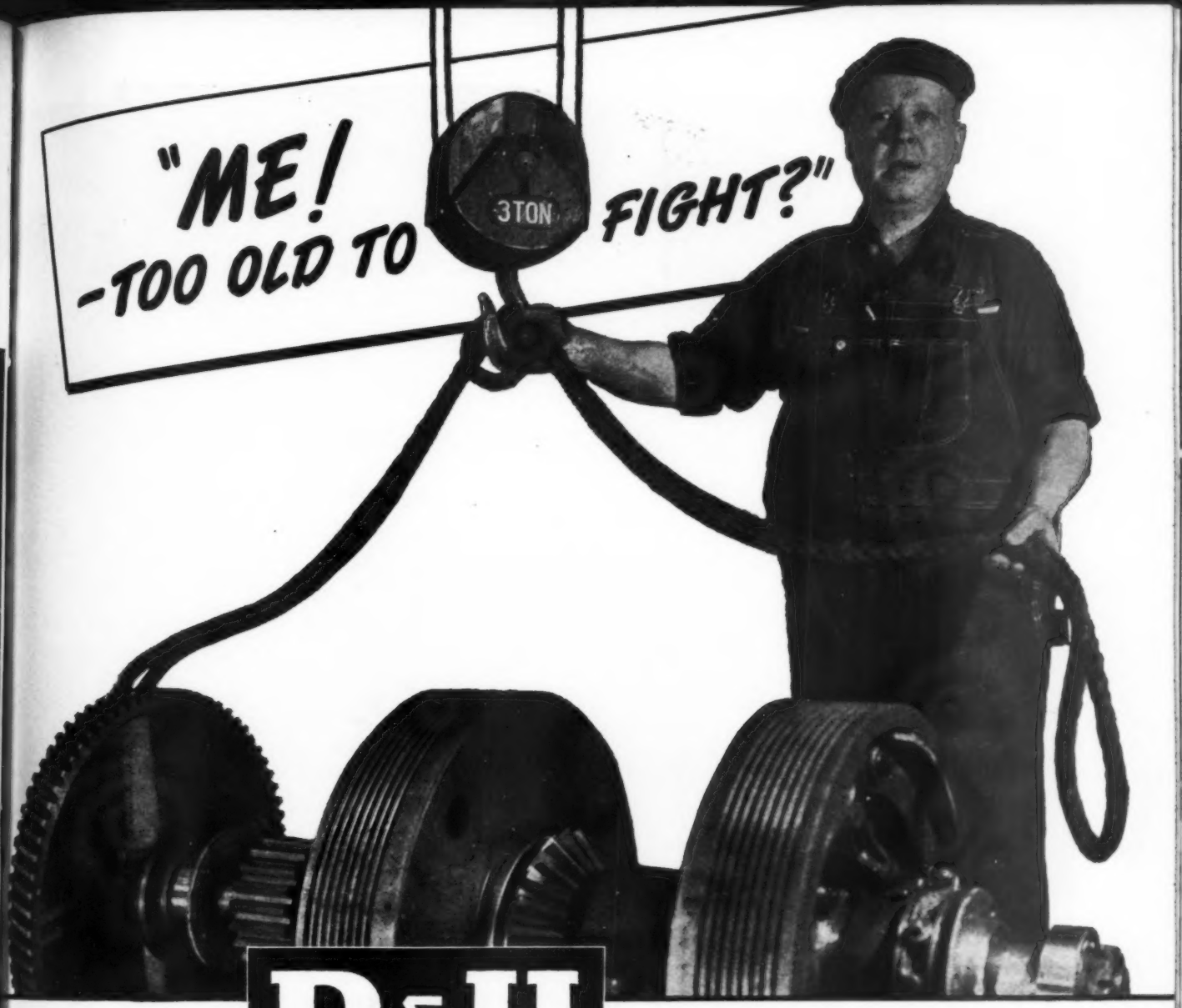
For details on J-M Transite Walls, see our Catalog in Sweet's, or write for brochure TR-22A, Johns-Manville, 22 E. 40th St., New York, N. Y.

J-M Transite Movable Asbestos Walls—J-M Acoustical Materials—J-M Asphalt Tile Floors are making an important contribution to speeding up war production in offices and plants everywhere.

JOHNS-MANVILLE

Asbestos

Transite Walls



P&H TRAV-LIFT CRANES

A new star has been added to P&H's award for excellence in war production.

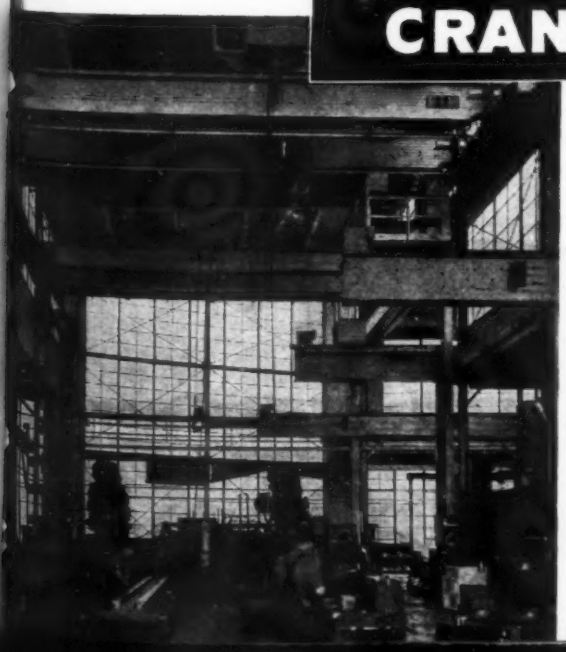
"Maybe the Marines won't take me! So what? There's a fighting job for me right here on the production line. And with these modern helps, I'll keep pace with the best of them!"

Now you're talking, Old Timer! And you can do it, too! For those old back-breaking, man-killing jobs are out wherever the P&H Trav-Lift comes in. Take any load up to 15 tons: You can pick it up *anywhere* in the area served by a Trav-Lift; you can move it, lower it precisely where you want it *without* rehandling. It's all done swiftly, smoothly; no effort to it.

Modern P&H Trav-Lifts are saving time and energy and speeding up production in war plants everywhere. They make more efficient fighters of production men in wartime. They cut handling costs any time.

Operated from the floor by magnetic push-button control. Five-speed variable speed control is also available. Built in capacities up to 15 tons for moderate duty or "helper" crane service. Write for literature.

General Offices: 4525 West National Ave., Milwaukee, Wis.



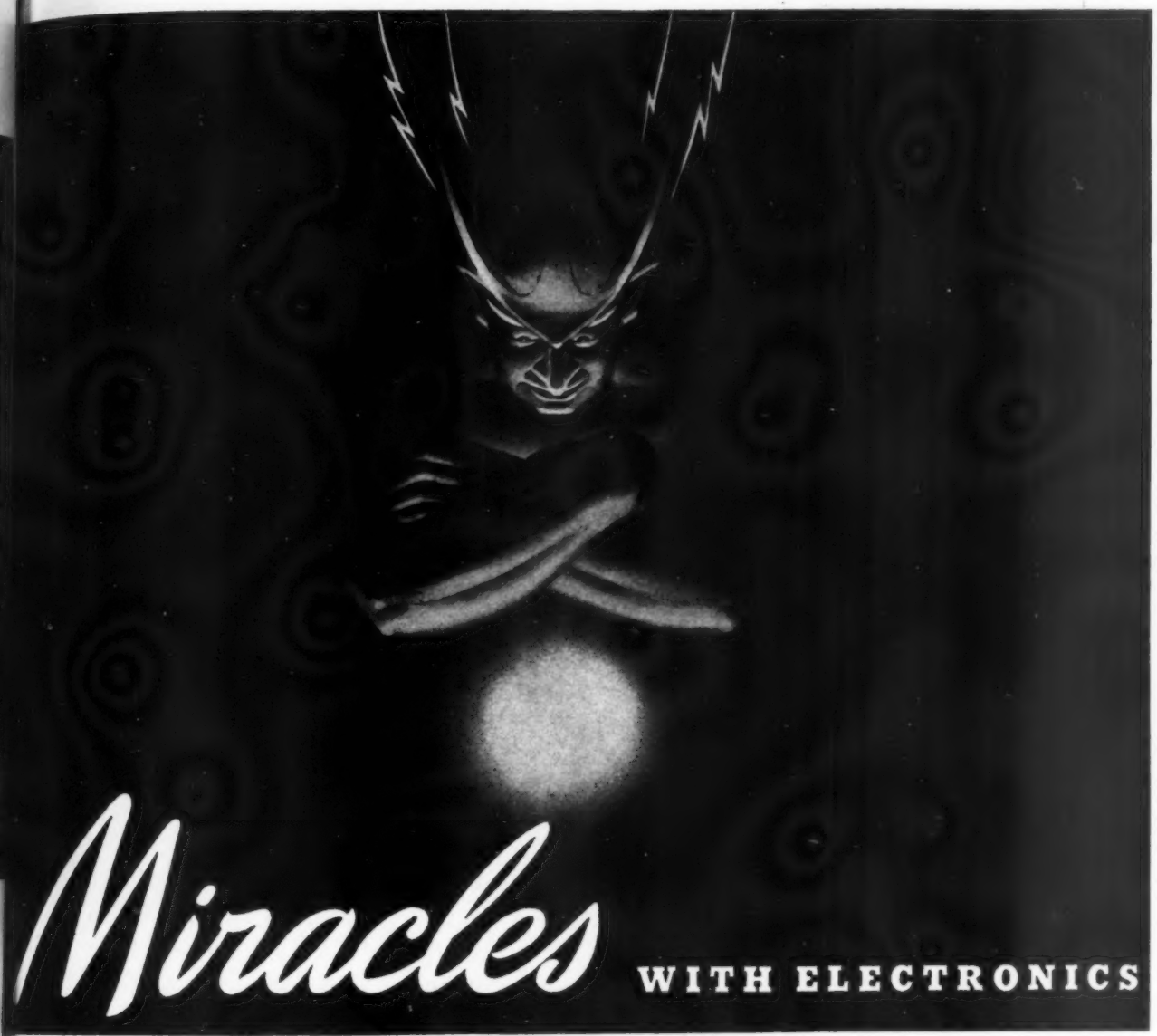
HARNISCHFEGER CORPORATION

ELECTRIC CRANES • EXCAVATORS • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS

Here is a crane dumping skid box that was developed by Union Metal engineers for the fast and efficient handling of oil-soaked metal chips from machining operations. It is oil-tight—free flowing and penetrating cutting oils cannot leak out all over your production areas. And it is all steel—no wood to become soaked and rotted. With this steel skid box you can dump your chips into oil separators and reclaim the oil for future use. Union Metal also makes steel pallets and skids for all materials handling uses.

UNION METAL

THE UNION METAL MANUFACTURING COMPANY
CANTON, OHIO



Miracles WITH ELECTRONICS

ELECTRONICS bids fair to revolutionize our every day living after the war. When Brown and Minneapolis-Honeywell placed experience and manufacturing resources at the call of our government, the result of several years of research in Electronics was immediately applied to instruments — for Testing airplanes in flight — for Controlling production of high octane gasoline — for Treatment of special alloy steels for tanks, guns and armor plate — for Manufacture of synthetic rubber — and for many other purposes entering directly into the war effort.

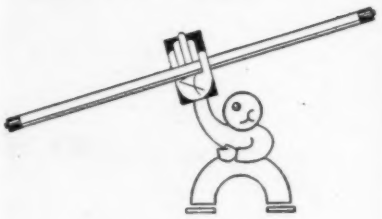
Extending this peacetime experience to the technique of war, will bear fruit when Peace comes again, in startling new developments in the Electronic control of industrial processes — busily engaged in peacetime production.

Instruments by **BROWN** *and Controls by*

MINNEAPOLIS-HONEYWELL

THE BROWN INSTRUMENT COMPANY, 4490 WAYNE AVENUE, PHILADELPHIA, PENNSYLVANIA
DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO.
MINNEAPOLIS, MINNESOTA, AND 119 PETER STREET, TORONTO, CANADA
Wadsworth Road, Perivale, Middlesex England — Nybrokajen 7, Stockholm, Sweden

"LONG LIFE"* says:



"ONLY ARTKRAFT GIVES YOU A 3,000-HOUR GUARANTEED FLUORESCENT LAMP!"

SIGNS OF LONG LIFE

• Artkraft Hot Cathode Fluorescent Lamps are actually guaranteed for 3,000 hours and have a rated life of 5,000 to 6,000 hours. They have been field tested for over five years under adverse conditions. Artkraft lamps feature a Constant-Temp hot cathode with a corrugated mesh-ribbon filament, which permits the use of an abundance of emissive compound. By controlling the temperature of the filament through the Constant-Temp feature, the cathode is not affected by fluctuations in the primary voltages, thereby protecting the emissive compound from being rapidly discharged. Artkraft's exclusive cathode design reduces blackening or darkening in the light column, resulting in a brighter, cleaner lamp. These, with other Artkraft exclusive features, make it truly a lamp of "Long Life."

OTHER EXCLUSIVE ARTKRAFT FEATURES:

NO STARTER SWITCHES. Artkraft resonant starting eliminates this trouble-maker.

CONSTANT VOLTAGE POWER PACK. Gives efficient operation at 85 to 135 volts. Can also be used on 220- and 440-volt systems, single or three-phase. Cannot short circuit the line.

100% POWER FACTOR at rated voltage. 98% or over within 85- to 135-volt range.

"EASY MOUNT" LUMINAIRE ALLOWS INSTANT REMOVAL WITHOUT TOOLS, FOR CLEANING NON-FERROUS REFLECTOR OR LAMPS.

Also

STROBOSCOPIC (FLICKERING) EFFECT REDUCED.

MORE LIGHT FOR THE SAME CURRENT.

MODERATE FIRST COST. RADICALLY REDUCED MAINTENANCE COST. Lamp replacements are less frequent, starter replacements eliminated, ballast replacements unknown, man-hours saved by making these replacements unnecessary.

Write for Circular F102

WHOLESALERS:
Write for our proposition

FIXTURE MANUFACTURERS:
Write for details on our fixture manufacturing license.

ARTKRAFT HOT CATHODE FLUORESCENT LIGHTING
Division of
THE ARTKRAFT SIGN CO.
1110 E. KIBBY ST.
LIMA, OHIO, U. S. A.

*Reg. U.S. Pat. Off.

THERE IS A PROPER BEARING METAL FOR EVERY APPLICATION

It is impossible to incorporate in one bearing alloy all the physical characteristics needed to meet all possible working conditions. Average conditions call for good resistance to compression plus excellent anti-frictional qualities. Under extreme conditions some of the anti-friction qualities must be sacrificed to obtain either malleability or hardness. Insist on a bearing metal that has been "alloyed" for your particular application.

90% of bearings in use today are subject to uniform speed and only moderate pressures, as in electric motors, line shafting and general machinery. For such services, use Magnolia Anti-friction Metal.

When bearings are subjected to heavy sustained pressures, such as in rolling-mill machinery, use lead-base Pyramid or tin base Power, hard metals which will not squeeze out.

For shock loads, which would crack the harder bearing metals, use lead-base Defender or tin-base Adamant, tough yet malleable metals. Internal combustion engines and trap rock crushers are typical applications.

GENERAL USE

HEAVY LOADS

SHOCK LOADS

NEW BULLETIN

Write for FREE 8-page bulletin which gives many helpful hints on how to keep bearings on the job and shows what bearing metal to use where.

MAGNOLIA METAL CO.• ELIZABETH, N. J.

MAGNOLIA BEARING METALS

FACTS ABOUT PLASTICS

Plastics are materials created with specific properties to fulfill required functions. If your product lends itself to plastics, and you select the right plastic for it you should obtain one or more of these results: improved performance, lower cost, better design.

Since 1894, General Electric has been making plastics parts, because plastics do certain jobs better than other materials. Today—in 1943—General Electric is the largest producer of plastics parts in the United States, manufacturing thousands of plastics products for improved combat weapons and essential industrial equipment.

For complete information about plastics—how you can use them efficiently and profitably—write Section L-3, One Plastics Avenue, General Electric Company, Pittsfield, Mass.

PLASTICS DEPARTMENT

GENERAL ELECTRIC

PD-3

θ...little known enemy of fighter planes

As ELECTRICAL ENGINEERS know, the Greek letter theta, θ, often stands for relative humidity.

Whenever θ is high, it's bad news for the electrical wiring and cable on fighter planes. For moisture in the air could so foul up the electrical system that it could prevent a quick take-off from an advanced camouflaged base like that pictured in the illustration.

The untiring efforts of the electrical industry, however, have licked this moisture problem.

Electrical design engineers put many kinds of materials and impregnants to exhaustive tests in their search for the proper insulation with high moisture resistance.

And they hit the right combination in the newest, most improved impregnants and Fiberglas.*

Fiberglas Electrical Insulations are all glass. Glass, being inorganic, does not absorb moisture. These insulations are therefore highly resistant to moisture. *In addition, they are highly resistant to heat . . . unaffected by most acids . . . possess high dielectric strength when combined with the proper impregnants.*

Miles and miles of power and lighting cable aboard many types of planes are Fiberglas-insulated. Approximately 85% of radio hookup wire for transmitters and receiving sets in aircraft is Fiberglas-insulated.

These facts are a measure of the successful use of Fiberglas by the electrical industry.

Besides, there are other huge and e growing wartime demands for Fibergl insulated motors and generators in t Army and Navy Air Forces. Vast qua tities of Fiberglas also go into oth electrical equipment needed on warsh and in the mechanized units of the Arm

Our production was tremendously i creased this last year. Right now, it constantly expanding month by mont YET—vital Army and Navy needs ha so far kept pace with this expansio These are the reasons why your el trical distributor has not always be able to fill orders promptly.

• • •

Owens-Corning Fiberglas Corporation Toledo, Ohio. In Canada, Fiberglas Can ada, Ltd., Oshawa, Ontario.

FIBERGLAS* ELECTRICAL INSULATIONS

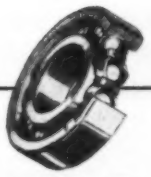
*T. M. Reg. U. S. Pat. Off.

Official Photo U. S. Army Signal Corps

WHO...WHERE...HOW MANY...AND HOW HIGH!

The slightest buzz or murmur in the earphones of this vigilant "listener" spells a story . . . a story that unravels uncannily with accurate, pertinent data on aircraft flying miles away. Its huge, sensitive ears need no eyes to spot foe or friend . . . where they are, how many, where they're heading. Its instincts are purely mechanical and developed to the nth degree, *a true product of Yankee genius.* Ball bearings help to give it the operating quietness so essential to its perfect functioning.

Battlefront equipment like this "listener" . . . range finders, communicators, all types of mechanical field units . . . require millions upon millions of ball bearings. Wherever there's movement in planes, in tanks, in guns, in all sorts of rolling equipment . . . you'll find friction-free, trouble-discouraging ball bearings. They're doing a mighty job "over there" and here at home too! For ball bearings are also essential to the machines that turn out this fighting equipment. The Fafnir Bearing Company, New Britain, Conn.



FAFNIR

BALL BEARINGS

THE BALANCED LINE • FOR ORDNANCE, AIRCRAFT AND INDUSTRIAL MACHINERY

The Red Cross has Problems like your own

—*of Planning*

Your Red Cross operates a vast planning program to enable it to be ready for any disaster or emergency anywhere—whether it comes in the Americas, Europe, Australia, Asia, or Africa.

—*of Organization*

Your Red Cross is responsible for the smooth operation of 3,750 chapters and 6,000 branches, all engaged in the same enterprise of helping all who need help.

—*of Personnel*

Your Red Cross has tripled its staff since Pearl Harbor and has had to enlist the aid of and train over 6,000,000 volunteers in the principles of First Aid, Water Safety, Accident Prevention, Home Nursing, Nutrition, Nurse's Aideing, Mass Feeding, Motor Mechanics, and other subjects allied to our country's war effort.

—*of Production*

Your Red Cross is not only one of the world's foremost purchasers of supplies, but it has the immense distribution job of collecting millions of items from 10,000 different communities in the United States, assembling and storing them, and then shipping them to practically every country in the world. Last year your Red Cross shipped some $60,000,000 worth of food, clothing, and medical supplies to over 20,000,000 homeless people in foreign countries.

—*of Finance*

Your Red Cross, whose war-time and post-war expenses will run well into hundreds of millions, must account to the public for every penny it collects and puts to work. Its accounts are audited annually by the U.S. War Department.

The Red Cross faces the same problems as are in your business. With your support it can successfully meet them.

The Second War Fund is greater than the First, but no greater than the increased needs.

Business men can help with time and with money, as organizations and as individuals.

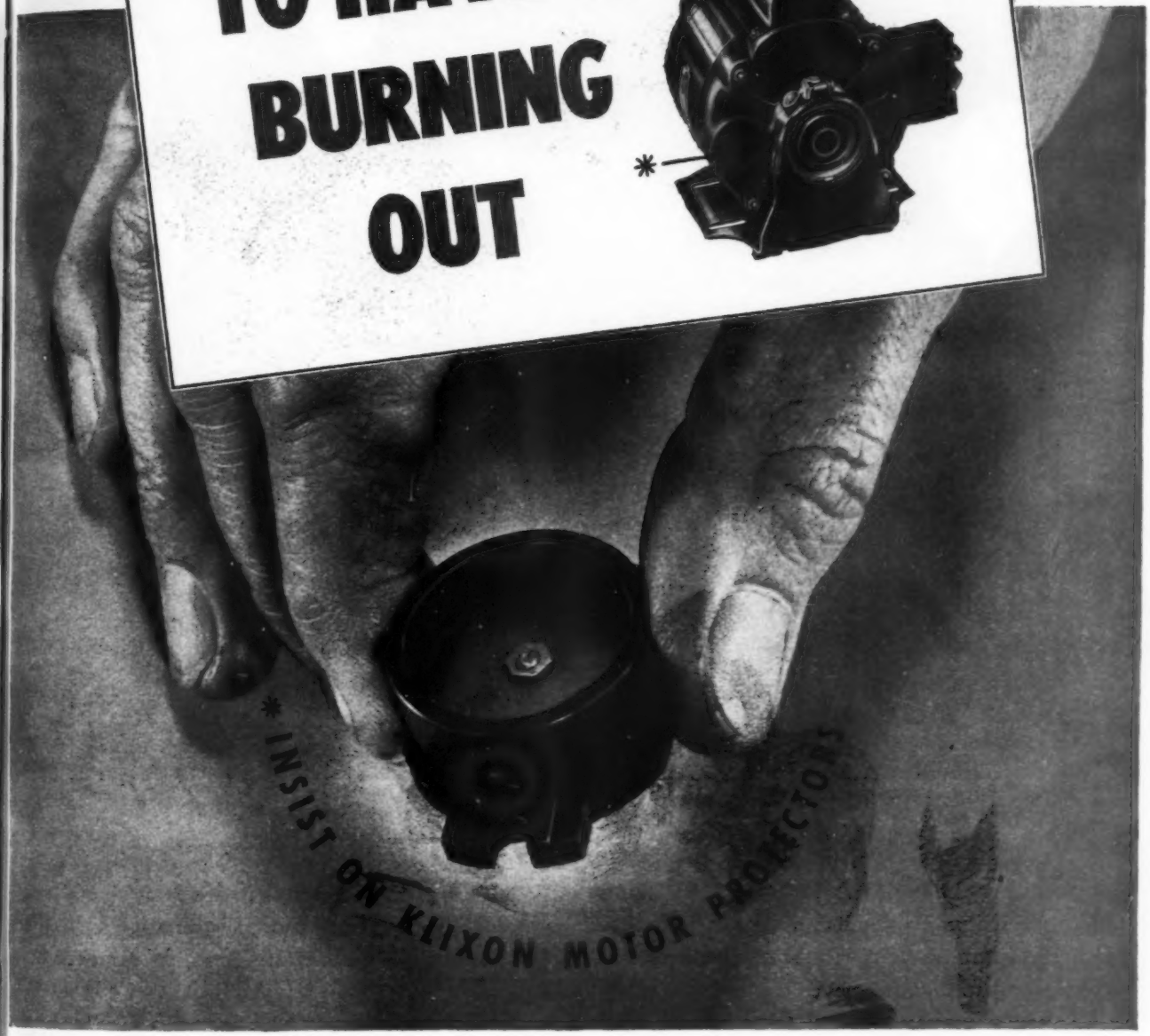
March is the Red Cross month . . . Cooperate with your Red Cross Chapter.

Your Dollars help make possible the

AMERICAN RED CROSS

This space contributed by the Publisher

THIS IS NO TIME TO HAVE MOTORS BURNING OUT



Motor burnouts cause production blackouts—plus copper loss, labor waste, repair costs and motor replacement delays.

Therefore, when buying motors, insist on built-in Klixon Protectors. These simple, foolproof and inexpensive protectors will protect your motors from burning out—either from overloading or overheating. They'll eliminate waste—stop production slowdowns—and wipe out a lot of repair costs and grief. Yes, they'll make it possible for you to use the smaller motors of today with greater safety than you had with larger motors without this protection.

A.C. motors (all sizes) and D.C. motors up to 30 volts can be supplied with built-in Klixon Protectors. Insist on this protection.

KLIXON

SPENCER THERMOSTAT CO., ATTLEBORO, MASSACHUSETTS

Is YOUR Advertising Manager Present at This Wartime Plant Activity Meeting . . . ?

He should be . . .

Your advertising manager can be of immeasurable help to you on your labor-management committee, war production drive, training program, scrap-salvage campaign, bond drive, absenteeism program and in countless other ways.

He has the ability to make people understand *what needs to be done, how to do it,* and *why!*

That's been his training.

He is a master of the craft of using the printed word to make people do things.

More than likely he is a member of his professional society, the National Industrial Advertisers Association. He and his fellow members have embarked on a VICTORY PROMOTIONS PLAN, the sole purpose of which is to apply the skills of the advertising man to wartime plant activities, some of which are mentioned above.

Your advertising manager knows that yours is the responsibility for plant operations, whereas his is the responsibility for supplementing it with the tools he is uniquely trained to use.

Your advertising man is at your service!

THE EDITORS OF FACTORY

WHERE TO BUY

Featuring additional products and specialties for manufacturing plants

Est. 1870 — ORANGEVILLE — Ask For CATALOG

ALL TYPES **FLOOR TRUCKS** WHEELS CASTERS

ORANGEVILLE MFG. CO.

Orangeville (Col. Co.) Penna.

$90,000.00 SAVED in ONE Plant . . . by "WELD-BILT" Materials Handling!

★ Let us show you how "WELD-BILT" Equipment and Engineering service can help YOU to similar labor, money, production-time savings in materials handling. ★

WEST BEND EQUIPMENT CORPORATION

★ Dept. FM.-13 West Bend, Wisconsin ★

HOW TO BUILD LAMP ANNUNCIATORS

Typical Annunciator Panel built with 600 units, for 120 V. service

Use Kirkland Bulls-I-units, (Underwriters Approved) to build Lamp Annunciators. It is only necessary to provide holes in the panel for each indication, insert the single hole mounting units, and the job is ready to wire and use.

Write for New Catalogue

Sold nationally by

THE GRAYBAR ELECTRIC CO.

Mfr'd by the H. R. Kirkland Co., Morristown, N. J.

KESTER FLUXES

are

44 Years Old

WRITE US YOUR PROBLEM

KESTER

SOLDER COMPANY

4213 Wrightwood Avenue, Chicago, Illinois

Eastern Plant: Newark, N. J.

Canadian Plant: Brantford, Ont.

A Good Habit . . .

This "Where to Buy" Section supplements other advertising in this magazine. . . . It's a good habit to check this page—every issue.

NEW ADVERTISEMENTS

received by March 25th will appear in the April issue subject to space limitations.

Address copy to the Departmental Advertising Staff

Factory Management and Maintenance

330 West 42nd St., New York City

. . . where operations run "too hot" for properly applied straight cutting oils . . .

. . . . and where ordinary soluble oils or paste compounds fail to give you satisfactory finish or tool life — USE Solvol! Developed especially for carbide and other high speed tools. Solvol has advantages to offer you in many applications. Put it on the job and watch the improvement.

USE **Stuart's**

SOLVOL

AQUAMIX

Liquid Cutting Compound

For All Cutting Fluid Problems

D. A. STUART OIL CO.

Chicago, U.S.A. • LIMITED • Est. 1865

Warehouses in Principal Metal Working Centers

INDUSTRIAL CONSULTANTS

The Trend Toward Economy—

The service of the consulting engineer is a real economy. With his knowledge of organization and production problems and his wide and varied experience, he can usually reveal the points of waste and inefficiency that are costing you money and suggest inexpensive means for their elimination.

ASSOCIATED ENGINEERS, INC.

Management Consultants

Engineering—Accounting

Organization—Methods—Costs

Old-First Bank Building, Fort Wayne, Indiana

METHODS ENGINEERING COUNCIL

MOTION AND TIME STUDY INDUSTRIAL MANAGEMENT
INSTRUCTION CONSULTATIONS
TRAINING INSTALLATIONS

Wood and Franklin Streets, Station 21
Pittsburgh, Pa.

JAMES J. BAER

Motion & Time Study Analysis

Supervisory Training

Industrial Engineering

65 Madison Ave. New York, N. Y.

ALLAN H. MOGENSEN

Training in Work Simplification

330 W. 42nd Street
NEW YORK CITY

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

15 cents a word, minimum charge $3.00. (See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS, 75 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. F.M.M.

NEW ADVERTISEMENTS received by March 25th will appear in the April issue subject to limitation of space available

WORKS MANAGER WANTED

Man 38 to 60 who knows how to make internal combustion motors and electric generators. Fully acquainted with mass assembly methods. Must be experienced and able to refer to previous similar positions with salary and time employed. Good salary with bonus. Now doing 100% War Work, position will continue after the war. Position of importance for a live "pusher" and experienced "planner".

P-516, Factory Mgt. & Maintenance
520 N. Michigan Ave., Chicago, Ill.

WANTED INDUSTRIAL ENGINEER

A well-established large manufacturer in Kentucky has a permanent job for qualified industrial engineer. Should have ability and experience on job analysis and classification time and motion studies. Give age, education, past experience, martial status and approximate salary wanted.

P-519, Factory Mgt. & Maintenance
330 W. 42nd St., New York, N. Y.

DOOR PRODUCTION MAN WANTED

Steel Door Production Man, preferably with engineering training, capable of handling details between office and plant and with experience as shop Foreman or Assistant Superintendent in steel hollow metal door plant. Actual requirement is for post-war production work but will consider immediate employment on war work in production or engineering department. Nationally known company offering an excellent opportunity to right man.

P-517, Factory Management & Maintenance
520 N. Michigan Ave., Chicago, Ill.

WANTED DRAFTSMAN

Competent draftsman experienced on internal combustion engines. Give full details of past experience, salaries drawn, and age, in first letter. Permanent.

P-521, Factory Management & Maintenance
520 N. Michigan Ave., Chicago, Ill.

WANTED

Process engineers (junior) to do general trouble shooting and help improve process of manufacture of small arms munitions. Applicants should have college training in science plus some experience in industry and mechanical arts. Should not be immediately subject to draft and preferably under 30. Location, Midwest.

P-523, Factory Management and Maintenance
520 North Michigan Ave. Chicago, Ill.

WANTED CHIEF ENGINEER

American born citizen age 35 to 60, experienced on light plants and small single cylinder diesel engines 5 to 25 h.p., whose objective is not to make the unit run but to design it so as to be competitive and easily made. Permanent position with salary and bonus if capable. Give previous positions held with dates and salaries. All correspondence strictly confidential. 100% War Work.

P-520, Factory Mgt. & Maintenance
520 North Michigan Ave., Chicago, Ill.

WANTED MANAGER OF WAREHOUSES AND SUPERINTENDANT OF OPERATIONS

For a national organization. Experienced, energetic man with ability to organize and handle operations and personnel. Some knowledge of engineering required. Rubber experience preferred. Applicationss will be treated in strict confidence.

P-524, Factory Management & Maintenance
330 West 42nd St., New York, N. Y.

POSITIONS VACANT

GRADUATE DESIGNER and draftsman for general plant and mine engineering particularly structural and material handling. Excellent working conditions. Liberal salary. State recent wage. P-525, Factory Management & Maintenance, 520 N. Michigan Ave., Chicago, Ill.

CHEMIST AND BACTERIOLOGIST experienced in the food field for position as Director of laboratory operated by national association. Preference given to man familiar with soft drink industry, and capable of addressing meetings and writing for publication. Apply in writing, giving brief history, references, salary, and draft status. Address American Bottlers of Carbonated Beverages, 1128 Sixteenth Street, N. W., Washington, D. C.

POSITIONS WANTED

PRODUCTION ENGINEER—Cornell, M.E., '32. 10 years industrial manufacturing experience—wallpaper, printing, textile, consulting and aircraft. Operating methods, layout, work simplification, time & motion study, controls, etc. Interested in executive or supervisory position only. PW-526, Factory Management & Maintenance, 68 Post Street, San Francisco, Cal.

PLANT MANAGER—Superintendent. Ability—organize, direct, and pleasingly influence people. Knowledge—metal trades, precision machining, estimating; expediting and buying material. Now plant superintendent but must move account wife's health. Only Southern California or Florida considered. Minimum salary $6000.00. PW-527, Factory Management & Maintenance, 330 W. 42nd St., New York, N. Y.

PERSONNEL MANAGER — Intimate knowledge of machine shop industry: two years on production machines. Thoroughly familiar with aptitude tests: three years interviewing, testing and vocational counseling. Completed evening course in Personnel Supervision at Yale. Term paper: "Women in Industry" given mark of A. Responsible references. PW-528, Factory Management & Maintenance, 330 W. 42nd St., New York, N. Y.

CONSTRUCTION OR MAINTENANCE SUPERINTENDENT, licensed electrician, estimating, layout, purchasing of materials, and full charge of all types of electrical work. Can secure release. Own car, will travel. U. S. born. PW-529, Factory Management & Maintenance, 330 W. 42nd St., New York, N. Y.

SALARIED POSITIONS

This advertising service of 33 years' recognised standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fees protected by refund provision. Identity covered and present position protected. Send for details.

R. W. BIXBY, INC.
276 Delward Bldg., Buffalo, N. Y.

EXECUTIVES AND TECHNICAL MEN

We solicit inquiries from qualified candidates who desire to contact employers for positions paying from $2,500 to $20,000 per year. Confidential. Est.28 years. *(Inquiries from Employers entail no obligation)*

THE NATIONAL BUSINESS BOURSE
H. H. Harrison, Director
20 W. Jackson Blvd., Chicago

Key Men For Industry

We offer an ethical personnel service to INDUSTRY as well as above average men in management, engineering and manufacturing who wish to improve themselves.

Curt E. Patton Personnel Eng'rs
53 W. JACKSON CHICAGO

MANUFACTURING EXECUTIVES and TECHNICAL MEN

Qualified men wanted for openings throughout the United States. Write for application, or submit experience record.

Inquiries solicited from responsible employers. All negotiations confidential. Est. 28 yrs.

HARRISON PERSONNEL SERVICE
20 W. Jackson Blvd. Chicago

SCIENTIFIC TRAINING

In Foremanship, Methods, and Time and Motion Studies, is vital to greater output—Today all over our nation industry is concentrating on one thing, more and better materials for our fighting forces.

Employers: Our key man training programs under the direction of recognized industrial engineers will train men of your selection in your plant.

Ambitious Workers: Our booklet "A Prospectus for Home Study" outlines training courses which will aid you to become more valuable to your employer.

METHODS ENGINEERING COUNCIL
Station 21 Pittsburgh, Pennsylvania

POSITION WANTED

GRADUATE ELECTRICAL ENGINEER — 33, married, one dependent, 6 years utility experience in Public Relations, Sales Promotion, Power Sales, application of Lighting and Power to Industry. Now completing assignment for Consulting Engineers; design and construction of all electric facilities, large naval air base. Desire permanent connection with future, in essential war industry. PW-531, Factory, 330 W. 42nd St., New York, N. Y

WORK WANTED

MANUFACTURERS' AGENTS successfully covering essential industries in the metropolitan New York area are open for an additional line. WW-530 Factory Management & Maintenance, 330 W. 42nd St., New York, N. Y.

For Selling Opportunity Advertising—See Opposite Page

SEARCHLIGHT SECTION

J. L. HEMPHILL & CO. Inc.
ELECTRICAL ENGINEERS AND EQUIPMENT
807 Williams St. North Bergen, N. J.

N. Y. C. Tel.: LOngacre 5-3227—N. J. Tel.: UNion 3-2600

MOTOR GENERATOR SETS

1—100 KW, 125 volt, Electric Products, syn.
1— 75 KW, 125 volt, G.E., sq. cg., 25 cycle.
1— 35 KW, 125 volt, Electric Machinery sq. cg.

TURBINES

1—600 KW, Terry, dual bleeder turbine only.
1—500-kw., General Electric, 3 phase, 60 cycle, 480 volt bleeder.
1—300 kw, 2300 volt, Westinghouse, non-condensing.
1—300-kw., 3 phase, 60 cycle, 220 volt, General Electric, condensing.
1—200-kw., General Electric, condensing.

TRANSFORMERS

2—400 KVA, General Electric, 4150-240/480 volts.
4—300 KVA, Pittsburgh, 7800/440 volts.
2—200 KVA, G.E., 4600/2300-230/460 volts.
3—150-kva., Pittsburgh, 6600/440 volts.
3—150 KVA, G.E., 33,000/2300 volts.
1—100 KVA, G.E., 2200/220/110 volts.
6—100-kva., Westinghouse, 13,200-250 volts.
2—75 KVA, G.E., 13,500/440 volts.
3—50-kva., Wagner, 4150-220 volts.
2—50-kva., Pittsburgh, 15,000/7500/110/220 volts.
3—37½-kva., General Electric, 2400/240/120 V.
3—25-kva., Westinghouse, 440/220-220/110 volts.

MOTOR—3 PHASE, 60 CYCLE

No.	H.P.	R.P.M.	Volts	Type
1	720	360	440	G.E. Syn.
1	560	1200	440	G.E.
1	400	514	440	West. Sl. Rg.
1	350	300	440	G.E. Sl. Rg.
1	350	100	220	G.E. Syn.
2	335	600	2200	G.E. Syn.
1	300	720	2200	G.E. slip. ring
1	250	514	4000	G.E. Syn.

VARIABLE SPEED 230 VOLT MOTORS

H.P.	R.P.M.	Type
2—100 Hp.	Electro Dynamic,	475-1375 R. P. M.
90	470-940	G.E.
75	525-1050	E.D.
1— 60	600-1200	G.E.
1— 60	500-1000	Diehl
1— 35	500-1500	Westinghouse
1— 35	Electro Dynamic,	350-1000 R. P. M.
1— 30	225-900	Crocker Wheeler
2— 25	300-900	Electro Dynamic

ENGINE SETS

13x15 Skinner Uniflow, 150/300 R.P.M, engine only.
16x36, Hamilton Corliss, heavy-duty, with 165 KW, 3 phase, 220 volt General Electric Generator.
120 KW, G.E., 3 phase, 220 volt, with Ames uniflow engine.
50 KW, Westinghouse, 3 phase, 320 volt; Fairbanks engine.

Complete Line of A.C. and D.C. Motors and Generators

SALESMEN WANTED
for

Complete line of quality Maintenance Products and Production Finishes; Shell Coatings, Finishes for Aircraft, Aircraft Accessories, Tanks, Synthetic Coatings and Finishes for manufactured products of all types.
Our products are approved by U. S. Army, Navy, Maritime Commission, Air Corps, Corps of Engineers, Chemical Warfare Service and all Government Departments and Agencies.
Exclusive territories available to men who have proven sales records. Philadelphia, Pittsburgh, Boston, New York, Baltimore and Buffalo territories open.
This is a permanent position—an excellent opportunity both now and after the war for a good volume of business and a liberal salary.
COMPENSATION—Salary and Bonus.
In replying, give full history, age and territory covered. Reply will be held confidential and should be complete to receive consideration.

SW-522, Factory Mgt. & Maintenance
330 W. 42nd St., New York, N. Y.

ESTABLISHED DISTRIBUTOR
Desires
MANUFACTURED ARTICLES

of Industrial Equipment and Supplies to sell in the New England area.

For references and further details write . . . giving information about your product . . . to

RA-518, Factory Management & Maint.
330 W. 42nd St., New York, N. Y.

-TRANSFORMERS-

TRANSFORMERS WANTED

in operating condition or burnt out. Mail us list giving complete nameplate data and stating conditions.

We Rewind, Repair and Redesign all Makes and Sizes
ALL TRANSFORMERS GUARANTEED FOR ONE YEAR
Prices quoted on request

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
STATION M Since 1912 CINCINNATI, OHIO

PRIME LOANS TO
CORPORATIONS and INDIVIDUALS
Unsecured or Collateralized
LARGE Sums—LOW annual rates.
COLLATERAL DISCOUNT CORP.
Graybar Bldg.—New York City

FOR SALE

Two (2) used horizontal tubular boilers 150 H.P. Approx. 6' x 18' with front and grates. Hand shaker. Good condition.

Price f.o.b. Mill Hall—$1,100.00

Can be seen at

Sylvania Electric Products, Inc.
MILL HALL, PA.

VALVES

INDUSTRIAL & MARINE

METROPOLITAN PLUMBING SUPPLY CO., INC.

Power Plant Valves and Engineering Specialities for Oil, Steam, Gas, Air, Liquids and Chemicals.
Jenkins, Fairbanks, Sarco, Powell Valves and surplus.
Large Complete Stocks ¼" to 24"
313 EAST 31st ST., NEW YORK CITY
For Hourly Nation-wide Shipments
CALL MUrray Hill 3-3400

CRANE PIPE & FITTINGS

COMPLETE INDUSTRIAL PLANT WITH MACHINE SHOP

For Sale or Rent on Long Term Lease

Located on fully enclosed six-acre plot—approximately 30,000 sq. ft. under cover, steel buildings, overhead traveling cranes, railroad spur on L.V. R.R. Suitable for any type of War Industry with only slight renovations required. Especially suitable for the manufacture of heavy machine parts. Now operating and ready for immediate occupancy.

For further details phone, wire or write

Greater N. Y. Contractors Machinery & Equipment Co., Inc.
258—23rd Street Brooklyn, N. Y.
Tel. South 8-4900

USED "DANDUX" CANVAS

Suitable for a variety of uses, available in different sizes. What are your requirements?

C. R. DANIELS, INC.
44 West Street New York, N. Y.

IS COPPER YOUR PROBLEM

We have perfected a machine which will reprocess and repair any motor field coil using strip copper or round and square wire #6 gauge or larger, by reinsulating and using the original wire. We do this by unwinding the coil, clean the wire, reinsulate the wire if necessary and rewind the coil. We call this service to your attention due to the uncertainty and long deliveries involved in the use of new copper.

Write for more information.

EVERSON ELECTRIC COMPANY
1126 Union Boulevard Allentown, Penna.

ELECTRICAL MACHINERY

Motors and Generators, A.C. and D.C. for sale at Attractive Prices. Large Stock. New and Rebuilt. All Guaranteed. Send us your Inquiries.

V. M. NUSSBAUM & CO.
FORT WAYNE, IND.

FOR SALE—USED AND RECONDITIONED

Roller gravity conveyor; Bottle and jar chain belt conveyor M.D.; chain conveyor for cases and cartons M.D.; belt conveyors, horizontal and inclined M.D.; bar-types boosters M.D.; spiral chutes, slide and roller bed; special conveyors; large stock; quick deliveries.

Island Equipment & Supply Co., Inc.
101 Park Ave., New York, N. Y.

COMPLETE POWER PLANT

Will sell subject government regulations and prior sale about March 1, 1943—3 Skinner Unaflow Engines with Westinghouse generators and exciters rated 1000—375—62½ KVA, all 440V—60 C 3 Ph. Also include 2 HRT Nu-Way Boilers rated 255 BHP each with Whiting Stokers, etc. Plant operating open for inspection. Sell as entire unit only.

P. O. Box 852 La Crosse, Wis.

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"It Takes a Tool that's Precision Built to Do Precision Work"

Just as water never rises higher than its source, so is the accuracy of your tool and die work limited by the accuracy of the tools, machines, and instruments you use. This is most important in your grinders, because grinding governs the most critical dimensions. Working to tolerances of one ten-thousandth is every-day practice with Dumore precision grinders, because these grinders are themselves built by craftsmen who work and think and talk in terms of a tenth. Equally important and equally accurate is the control of all inertia forces by dynamic balancing of supreme sensitivity — not by assemblies, but piece by piece and part by part. See for yourself the secrets of Dumore precision in the drawing below.

THE DUMORE COMPANY, Dept. 413-C RACINE, WISCONSIN

---

1. MOTOR HOUSINGS are compact and sturdy . . . designed for easy portability.

2. PRE-LOAD SPRING assures smooth running bearings at high speeds. (Pat. 2,188,251.)

3. PULLEYS are balanced to increase belt life and give full power transmission.

4. ENDLESS DRIVE-BELTS, carefully selected for smoothness, are another aid to accuracy.

5. DYNAMIC BALANCING OF armatures and rotating parts does the utmost to prevent vibration and increase precision.

6. PRE-EXPANDING armature windings, then double-dipping in enamel and baking them, prevents centrifugal "breathing."

7. LEAD WIRES are swaged to commutators by special Dumore process to assure 100% electrical contact permanently.

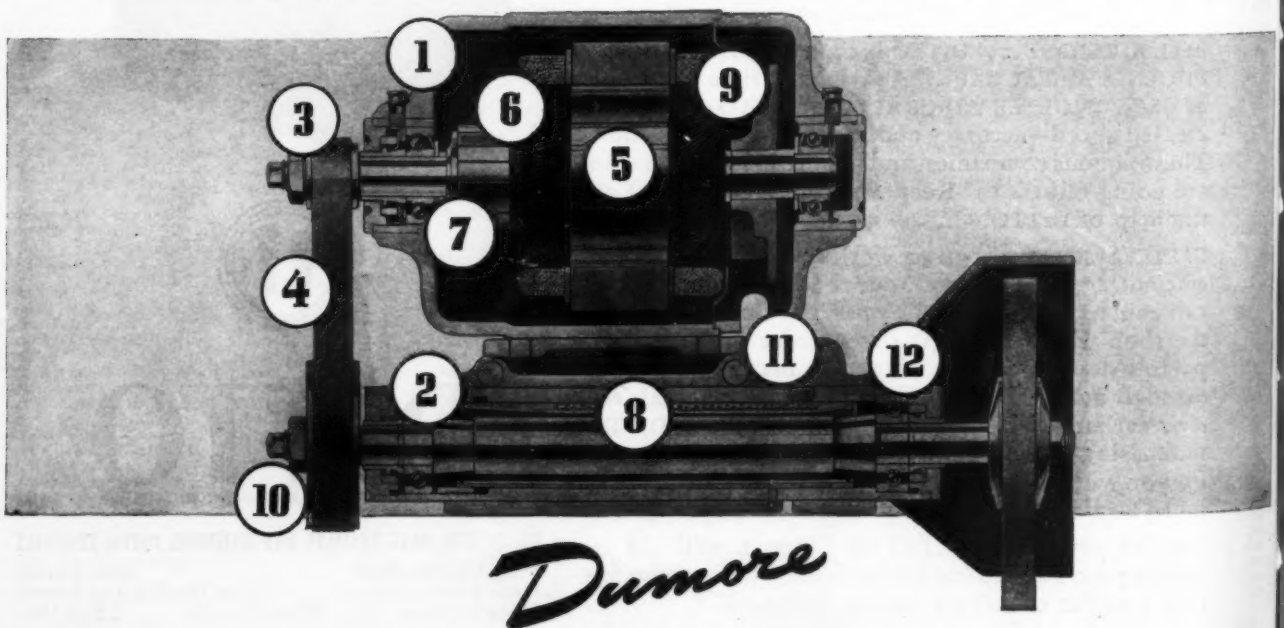
8. "FOG-OF-OIL" LUBRICATION to the quill bearings. A felt tube within the quill, extending to tapered ends of the main spindle, is held in place by a metal liner. Felt fingers at each end of the felt tube ride on the spindle surface, which is tapered to form an oil slinger. As the spindle revolves, it picks up a minute amount of oil from these fingers and the taper carries the oil along the spindle to the top, where it is thrown into the bearings in a fog. (Pat. No. 1,859,068.)

9. FAN DRAWS air in through a filter, provides blast to keep both motor and quill cool.

10. AUTOMATIC BELT TENSION gives long belt life and maximum power transmission.

11. UNIQUE FRAME CONSTRUCTION assures rigid mounting, required in precision grinding.

12. BALL BEARINGS are selected with infinite care for countless hours of vibrationless running.

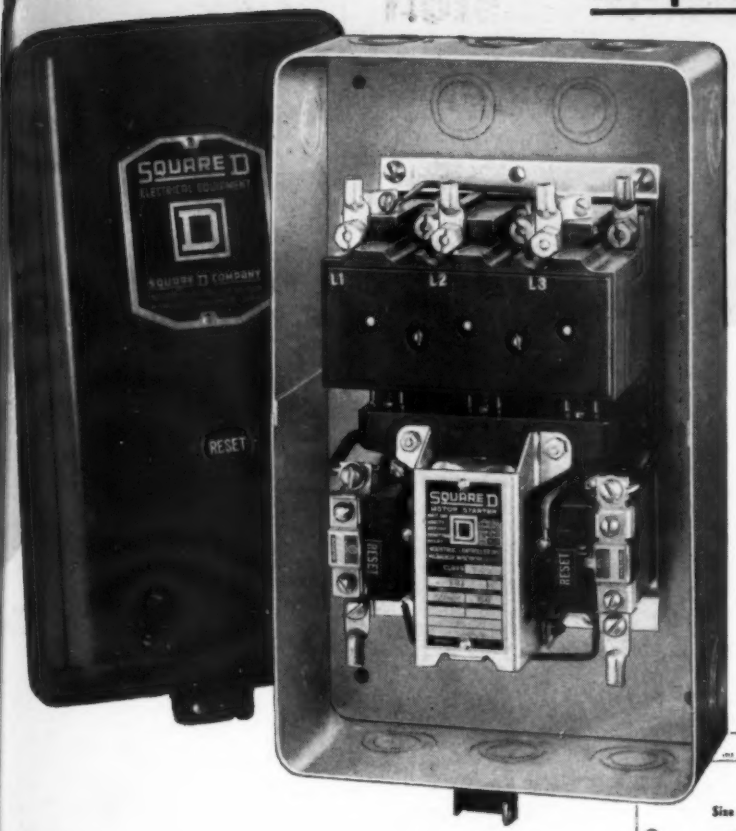


Dumore

PRECISION GRINDERS

Simplify MOTOR CONTROL MAINTENANCE

SQUARE D makes it easy by providing complete illustrated instructions with every starter



● Whether they're "old hands" or new on the job, men who do the electrical maintenance work like two things about Square D motor control.

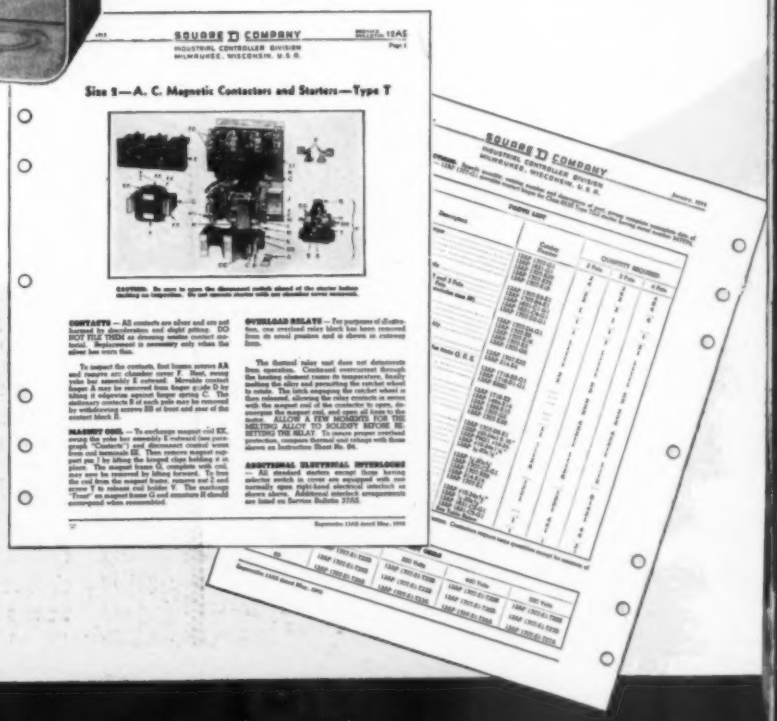
First—simple, understandable servicing instructions are included with every starter.

Second—all renewable parts of Square D motor starters can be inspected or replaced, using only a screwdriver and without disturbing any external connections.

Both are important factors, especially during these days of all-out production. One eliminates guesswork. The other saves precious time.

● Top operating efficiency and long life of electric motor starters depend largely upon regular inspection and occasional servicing. For best results, follow the manufacturer's instructions.

Square D provides these instructions in the form of a "service bulletin." On the front of this bulletin appear the maintenance instructions and a partially "exploded" photograph of the starter with key letters and arrows to identify the parts. On the back is given the photograph key letter, description, catalog number and quantity required of each part. Complete ordering instructions are given, making it a simple matter to order replacement parts, if necessary.


SQUARE D COMPANY

INDUSTRIAL CONTROLLER DIVISION
MILWAUKEE, WISCONSIN, U.S.A.

Size 1—A. C. Magnetic Contactors and Starters—Type T

CONTACTS — All contacts are silver and are not harmed by discoloration and slight pitting. DO NOT FILE THEM as dressing wastes contact material. Replacement is necessary only when the silver has worn thin.

To inspect the contacts, first loosen screws AA and remove arc chamber cover F. Next, swing yoke bar assembly E outward. Movable contact fingers A may be removed from finger grips D by lifting it edgewise against finger spring C. The stationary contacts B of each pole may be removed by withdrawing screws BB at front and rear of the contact block B.

MAGNET COIL — To exchange magnet coil KK, swing the yoke bar assembly E outward (see paragraph "Contacts") and disconnect control wires from coil terminals KK. Then remove magnet support nut J by lifting the latch clips holding it in place. The magnet frame G complete with coil may now be removed by lifting forward. To free the coil from the magnet frame, remove nut L and screw V to release coil holder T. The magnet "Frame" on magnet frame G and armature H should correspond when remembered.

OVERLOAD RELAY — For purposes of illustration, one overload relay block has been removed from its usual position and is shown in outward form.

The thermal tubes unit does not deteriorate from operation. Continued overcurrent through the heating element causes its temperature, finally melting the alloy and permitting the ratchet wheel to rotate. The latch engaging the ratchet wheel is then released, allowing the relay contacts in series with the magnet coil of the contactor to open, de-energizing the magnet coil, and causing all arms in the starter. ALLOW A FEW MOMENTS FOR THE MELTING ALLOY TO SOLIDIFY BEFORE RESETTING THE RELAY. To ensure proper overload protection, compare thermal relays with those shown on Instruction Sheet No. 94.

ADDITIONAL ELECTRICAL INTERLOCKS — All standard starters except those having selector switch in cover are equipped with one normally open right-hand electrical interlock as shown above. Additional interlock arrangements are listed on Service Bulletin 37352.

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

Dodge-Timken Pillow Blocks on kettle drive shaft in a large gypsum plant.

Is friction stealing your power — increasing power costs? Is excessive maintenance stealing your time—reducing production? Does lubrication require too much attention? Is lubricant leakage a constant threat to your product?

All of these things can happen—are happening in many plants where obsolete power transmission equipment is used.

Now, of all times, they should not be permitted to continue because of (1) interference with the war program (2) the economic waste involved.

They can be stopped cold by replacing worn-out, friction-ridden line shaft hangers and pillow blocks with modern Timken Bearing Equipped units. Then power will go on its way unmolested; maintenance and lubrication time will be saved; costs will take a headlong dive to new low levels. Check up on the power transmission situation in your plant *now*. The Timken Roller Bearing Company, Canton, Ohio.

The One Test For Every Decision—Will It Help To Win The War?

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

"All There Is In Bearings"

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